EO 05-45B-1

A FLT

ROYAL CANADIAN AIR FORCE

AIRCRAFT OPERATING INSTRUCTIONS

EXPEDITOR 3

(This EO replaces EO 05-45B-1 dated 1 Jul 57 and Advance Revisions #1 and #3 to #37 incl.)

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

1 JUN 60

LIST OF RCAF REVISIONS

DATE	PAGE NO	DATE	PAGE NO

T R A I N I N G C O M M A N D

TECHNICAL INSTRUCTIONS

EXPEDITOR AIRCRAFT
CARRYING OF SUPPLEMENTAL
ANTI-ICER FLUIDS

TCTI D4/2
1 Dec 58

1 Training Command message FS111 dated 27 Nov 58 directs that a container 40D141 or equivalent, filled with the appropriate type of anti-icing fluid, and stencilled as to the contents, is to be carried as a supplementary source of supply in all Training Command Expeditor aircraft at all times during seasons when icing conditions are likely to be encountered.

2 The location of the container in the aircraft is to be at unit discretion, but, the area selected must meet the provisions of EO 05-1-2AG relative to security and combustion factors.

3 Local orders are to be issued to establish the season or period when supplemental fluid is to be a regular part of the aircraft equipment, and, to define the procedure for checking of container contents and L14 signature acknowledgement.

4 Proper stowage techniques, suitable container, adequate checking of contents, and the observance of no smoking during refilling operations in the air will be necessary to increase rather than reduce the safety factors during ground and flight operation.

5 A copy of this leaflet is to be inserted in front of EO 05-45B-1 and -7 in the appropriate EO binder.

Issued on the authority of the AOC TC

FOREWORD

1 This publication is divided into four Parts:- Description, Handling, Emergency Handling and Operating Data.

2 PART 1 : DESCRIPTION of the controls and equipment with which the pilot should be acquainted.

3 PART 2 : HANDLING describes the normal handling of the aircraft by the pilot.

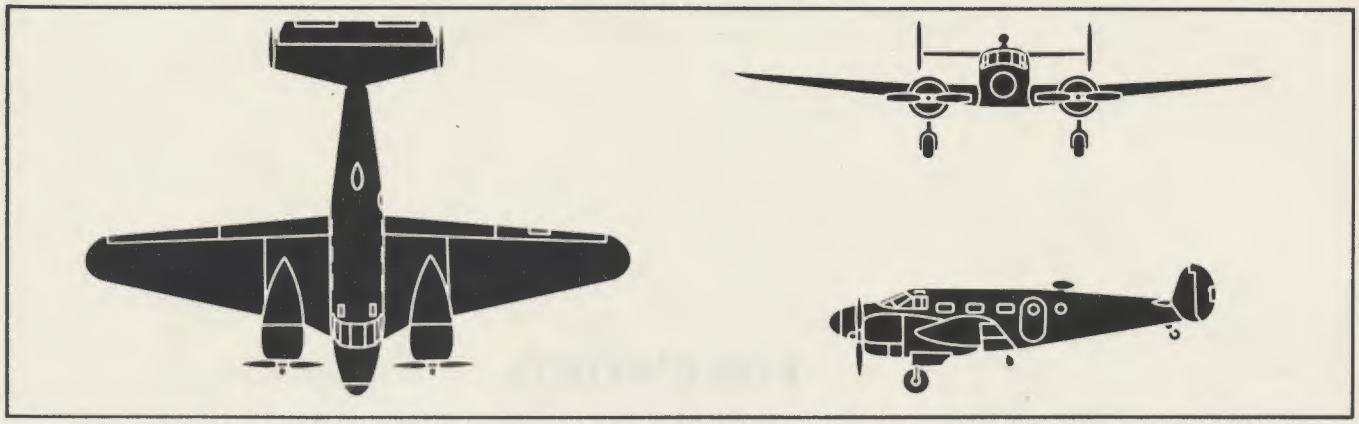
4 PART 3 : EMERGENCY HANDLING describes the emergency handling of the aircraft by the pilot.

5 PART 4 : OPERATING DATA gives the flying and engine limitations and includes information on fuel consumption, range and endurance under various conditions of flight.

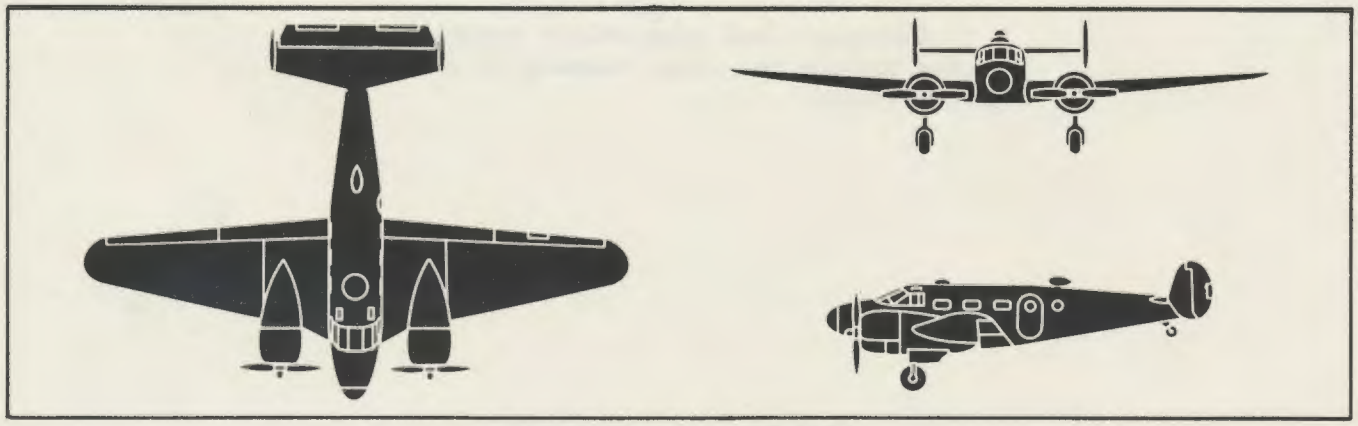
6 These notes are complementary to EO 05-1-1 Pilot's Operating Instructions General and assume a thorough knowledge of its contents.

7 In the text, words written in capital letters indicate actual markings on the controls concerned.

8 Comments and suggestions should be forwarded through the usual channels to Air Force Headquarters.



EXPEDITOR 3T AND 3TM



EXPEDITOR 3N AND 3NM

TABLE OF CONTENTS

PART	TITLE	PAGE
1	**DESCRIPTION**	
	GENERAL	1
	INTRODUCTION	
	VERSIONS	1
	FURNISHINGS	1
	CREW	1
	POWER PLANTS	1
	LEADING PARTICULARS	
	DIMENSIONS	1
	WEIGHT DATA	2
	TANK CAPACITIES	2
	FUEL SYSTEM	
	TANKS	6
	TANK SELECTORS	6
	WOBBLE PUMPS	6
	FUEL PRESSURE WARNING SYSTEM	6
	FEATHERING	6
	FUEL CONTENTS	6
	OIL SYSTEM	
	OIL SHUT-OFF VALVE	6
	OIL BY-PASS VALVE	6
	OIL COOLING SHUTTER	8
	OIL VENTING	8
	OIL PRESSURE	8
	OIL DILUTION	8
	PROPELLER FEATHERING AND GOVERNING	8
	FLYING CONTROL SYSTEM	
	CONTROL SURFACES	8
	ELEVATOR TRIM TABS	8
	AILERON TRIM TAB	10
	RUDDER TRIM TAB	10
	FLIGHT CONTROL LOCK	10
	WING FLAPS	10
	HYDRAULIC SYSTEM	
	BRAKE SYSTEM	11
	ELECTRICAL SYSTEM	
	POWER SUPPLY	13
	EXTERNAL POWER FACILITIES	13
	POWER SUPPLY CONTROLS	14
	CIRCUIT BREAKERS	17
	SPARE BULBS	17

TABLE OF CONTENTS (CONT'D)

PART	TITLE	PAGE
1	VACUUM SYSTEM	
	GYRO INSTRUMENTS	17
	DE-ICER BOOTS	18
	SUCTION GAUGE	18
	POWER PLANT CONTROL SYSTEM	
	FUEL TANK SELECTORS	18
	WOBBLE PUMP	18
	MIXTURE CONTROLS	18
	EMERGENCY FUEL CONTROL	20
	FUEL PRESSURE WARNING LIGHTS	20
	THROTTLE	20
	CARBURETTOR	20
	PRIMER	21
	IMPELLER	21
	ENGINE COOLING	21
	STARTER	21
	BOOSTER	21
	PROPELLER	23
	LANDING GEAR SYSTEM	
	DESCRIPTION	23
	LANDING GEAR SWITCH	23
	LANDING GEAR WARNING SYSTEM	23
	BRAKE SYSTEM	
	MAIN WHEEL BRAKES	24
	PARKING BRAKES	24
	HEATING SYSTEM	
	DESCRIPTION	24
	HOT AIR CONTROL	24
	COCKPIT HEATING (3T)	24
	CABIN HEATING (3T)	24
	COCKPIT HEATING (3N and 3NM)	24
	CABIN HEATING (3N and 3NM)	25
	CABIN HEATING (3TM)	25
	VENTILATING SYSTEM	
	CABIN SUPPLY (3N, 3NM and 3TM)	25
	COCKPIT SUPPLY (3N, 3NM and 3TM)	25
	COCKPIT SUPPLY (3T)	25
	CABIN SUPPLY (3T)	25
	EXHAUST	25
	ANTI-ICING AND DE-ICING SYSTEMS	
	WING AND STABILIZER DE-ICING	26
	PROPELLER ANTI-ICER	26
	PITOT HEAD ANTI-ICER	27

TABLE OF CONTENTS (CONT'D)

PART	TITLE	PAGE
1	WINDSHIELD AND ASTRODOME DEFROSTING	27
	CARBURETTOR ANTI-ICING	27
	FLIGHT AND ENGINE INSTRUMENTS	
	CARBURETTOR MIXTURE TEMPERATURE GAUGE	27
	OIL TEMPERATURE GAUGE	27
	FLAP INDICATOR	27
	ELEVATOR TAB INDICATOR	27
	FUEL LEVEL GAUGE	27
	MANIFOLD PRESSURE GAUGE	27
	FREE AIR TEMPERATURE GAUGE	27
	GYRO INSTRUMENTS	27
	GYRO HORIZON INDICATOR	28
	INTERIOR LIGHTING EQUIPMENT	
	GENERAL	28
	INSTRUMENT PANEL LIGHTS	28
	MAP LIGHTS	28
	CABIN LIGHTS	28
	NAVIGATOR'S LIGHTS	28
	READING LAMPS	28
	BAGGAGE COMPARTMENT LIGHTS	29
	EXTERIOR LIGHTING EQUIPMENT	
	NAVIGATION LIGHTS	29
	LANDING LIGHTS	29
	COCKPIT EQUIPMENT	
	PILOT'S AND CO-PILOT'S SEATS	29
	INERTIA REEL LOCKS	29
	WINDOWS	29
	EMERGENCY EQUIPMENT	
	HAND FIRE EXTINGUISHERS	29
	ENGINE FIRE EXTINGUISHER SYSTEM	30
	FIRE DETECTION LIGHTS	30
	ENGINE FIRE EXTINGUISHER DISCHARGE INDICATOR	30
	SIGNAL PISTOL	31
	FLARE CHUTE	31
	CRASH AXE	31
	EMERGENCY EXIT	31
	MAIN DOOR HINGE EMERGENCY RELEASE	31
	ASTRODOME EMERGENCY RELEASE	31
	FIRST AID KIT	32
	EMERGENCY MAPS AND FORCED LANDING INSTRUCTIONS	32
	PARACHUTES	32
	NAVIGATION EQUIPMENT	
	GENERAL	32

TABLE OF CONTENTS (CONT'D)

PART	TITLE	PAGE
1	DRIFT RECORDER	33
	DRIFT METER	33
	ASTRODOME	33
	COMMUNICATIONS EQUIPMENT	
	GENERAL	33
	COMMAND INSTALLATION	33
	RADIO COMPASS	34
	RADIO COMPASS TRANSFER BUTTON	34
	COMPASS FUNCTION SWITCH	37
	TUNING DIAL	37
	COMPASS TUNING METER	37
	COMPASS "CW" AND "VOICE" SWITCH	37
	LOOP "L-R" CONTROL	37
	VHF TRANSCEIVER	37
	MARKER BEACON RECEIVER	37
	ILS RECEIVERS AND INDICATORS	37
	INTERPHONE SYSTEM	38
	ISOLATION AMPLIFIER	38
	JACK BOX	38
	OTHER CONTROLS	38
	PASSENGER CARRYING EQUIPMENT	
	SEATING	38
	BAGGAGE COMPARTMENTS	38
	MISCELLANEOUS EQUIPMENT	
	NAVIGATORS' POSITIONS	39
	DATA AND MAP CASES	39
	ASHTRAYS	39
	RELIEF EQUIPMENT	39
	WINDSHIELD WIPERS	39
	BLIND FLYING CURTAINS	39
	COVERS	39
	PICKETING ROPES	40
	BATTERY CARD HOLDER	40
	WEIGHT AND BALANCE DATA SHEET	40
	CABIN - COCKPIT PARTITIONING CURTAIN	40
2	**HANDLING**	
	INTRODUCTION	41
	PRELIMINARIES	41
	PRE-START CHECKS	41
	EXTERNAL CHECK	41
	INTERNAL CHECK	45
	COCKPIT CHECK	45
	STARTING PROCEDURE	46
	FAILURE TO START PROCEDURE	48
	WARMING UP PROCEDURE	48

TABLE OF CONTENTS (CONT'D)

PART	TITLE	PART
2	TARMAC CHECK	48
	TAXIING PROCEDURE	49
	ENGINE AND ACCESSORY CHECK	49
	TAKE-OFF PROCEDURE	
	PRE-TAKE-OFF CHECK	50
	TAKE-OFF	51
	MINIMUM RUN TAKE-OFF	51
	CROSS-WIND TAKE-OFF	52
	CLIMB	
	POST TAKE-OFF CHECK	52
	CRUISING FLIGHT	
	LEVELLING OUT	52
	LEANING THE MIXTURE	54
	POWER SETTINGS	54
	FLYING THROUGH SEVERE TURBULENCE	54
	FLYING FOR MAXIMUM RANGE	54
	FLYING FOR MAXIMUM ENDURANCE	54
	FEATHERING	54
	UNFEATHERING	55
	MANAGEMENT OF THE FUEL SYSTEM	
	FUEL TANK SELECTION	56
	FUEL TRANSFER	56
	FUEL TANK LIMITATION	56
	TANK SELECTION	56
	FLIGHT CHARACTERISTICS	
	GENERAL	57
	STALLING	57
	SPINNING	57
	AEROBATICS	57
	DIVING	57
	HEATING AND VENTILATING	
	COCKPIT 3N, 3NM AND 3TM	57
	CABIN 3N, 3NM AND 3T	58
	CABIN 3TM	58
	LANDING PROCEDURES	
	BEFORE ENTERING TRAFFIC PATTERN	58
	TRAFFIC PATTERN CHECK LIST	58
	BASE LEG	59
	FINAL APPROACH	59
	CROSS-WIND LANDING	59
	MINIMUM RUN LANDING	60
	OVERSHOOT	60

TABLE OF CONTENTS (CONT'D)

PART	TITLE	PAGE
2	AFTER LANDING	60
	POST-LANDING CHECK	60
	END OF FLIGHT PROCEDURE	
	STOPPING ENGINES	60
	BEFORE LEAVING AIRCRAFT	61
	PICKETING THE AIRCRAFT	61
	COLD WEATHER OPERATION	
	BEFORE ENTERING AIRCRAFT	61
	AFTER ENTERING AIRCRAFT	61
	STARTING ENGINES	61
	WARMING UP	62
	TAXIING	62
	ENGINE AND ACCESSORY CHECK	62
	TAKE-OFF	62
	AFTER TAKE-OFF, CLIMB AND DURING FLIGHT	62
	DESCENT AND LANDING	63
	STOPPING THE ENGINES	63
	OIL DILUTION	63
	BEFORE LEAVING AIRCRAFT	63
3	**EMERGENCY HANDLING**	
	INTRODUCTION	65
	ENGINE FAILURE	65
	FLIGHT CHARACTERISTICS UNDER PARTIAL POWER	65
	ENGINE FAILURE BEFORE BECOMING AIRBORNE	65
	ENGINE FAILURE DURING TAKE-OFF	65
	BELOW SAFETY SPEED	65
	ENGINE FAILURE DURING TAKE-OFF	65
	SAFETY SPEED ATTAINED	65
	ENGINE FAILURE DURING FLIGHT	66
	MAXIMUM GLIDE	66
	LANDING WITH ONE ENGINE INOPERATIVE	67
	GO-AROUND WITH ONE ENGINE INOPERATIVE	67
	PROPELLER FAILURE	67
	RUNAWAY PROPELLER	67
	FIRE	
	ENGINE FIRE ON GROUND	67
	ENGINE FIRE IN FLIGHT	67
	FUSELAGE FIRE	68
	ELECTRICAL FIRE	68
	SMOKE ELIMINATION	68
	EMERGENCIES	
	FORCED LANDING	68
	EMERGENCY ENTRANCE	68
	DITCHING	68

TABLE OF CONTENTS (CONT'D)

PART	TITLE	PAGE
3	ABANDONING IN FLIGHT	71
	EMERGENCY OPERATION OF LANDING GEAR	71
	EMERGENCY OPERATION OF WING FLAPS	75
	ELECTRICAL FAILURE	75
	MISCELLANEOUS EMERGENCY EQUIPMENT	76
4	**OPERATING DATA**	
	INTRODUCTION	77
	ENGINE RESTRICTIONS	
	MAXIMUM OVER SPEED	77
	MAXIMUM TAKE-OFF POWER	77
	MAXIMUM CONTINUOUS POWER	77
	THROTTLE AND PROPELLER CONTROLS	77
	FUEL GRADES	77
	FLIGHT RESTRICTIONS	
	AIRSPEED LIMITATIONS	77
	RECOMMENDED SPEEDS	77
	SINGLE-ENGINE SPEEDS	77
	PROHIBITED MANOEUVRES	78
	INSTRUMENTS	78
	WEIGHT AND BALANCE DATA	78
	SAMPLE FLIGHT PLANNING PROBLEM	78

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1-1	General Arrangement Diagram, Expeditors 3N and 3NM	3
1-2	General Arrangement Diagram, Expeditor 3TM	4
1-3	General Arrangement Diagram, Expeditor 3T	5
1-4	Fuel System, Schematic Diagram	7
1-5	Oil System, Schematic Diagram	9
1-6	Pilot's Position	10
1-7	Control Pedestal	10
1-8	Flight Control Lock	11
1-9	Electrical Power Supply, Schematic Diagram	12
1-10	External Power Receptacle	13
1-11	External Power Connected	13
1-12	Pilot's Sub-Panel	14
1-13	Circuit Breaker and Junction Box Diagram (3N, 3NM and 3TM)	15
1-14	Circuit Breaker and Junction Box Diagram (3T)	16

LIST OF ILLUSTRATIONS (CONT'D)

FIGURE	TITLE	PAGE
1-15	Co-Pilot's Sub-Panel	17
1-16	Co-Pilot's Position	18
1-17	Main Instrument Panel	19
1-18	Air Induction System, Schematic Diagram	20
1-19	Cowl Flap Positions	22
1-20	Astrodome De-Frosting Control	25
1-21	Diagram of Cockpit Floor	26
1-22	Hand Fire Extinguisher (Main Spar Bulkhead)	30
1-23	Hand Fire Extinguisher (Rear Cabin Bulkhead)	30
1-24	Signal Pistol Stowage	31
1-25	Crash Axe Stowage	31
1-26	Emergency Exit Ejection Mechanism	32
1-27	Cabin Door Hinge Emergency Release	32
1-28	Astrodome Emergency Release Handle	32
1-29	Forward Navigator's Position	33
1-30	Rear Navigator's Position	33
1-31	B-5 Drift Recorder	34
1-32	Master Radio Control Panel	34
1-33	Radio Equipment Location Diagram (3N, 3NM and 3TM)	35
1-34	Radio Equipment Location Diagram (3T)	36
1-35	Navigation Instructor's Seat	39
1-36	Blind Flying Curtain Installation	40
2-1	External Inspection Diagram	42
2-2	External Inspection	44
2-3	Cross-wind Component Graph	53
2-4	Maximum Flow Positions of Inlet Louvres	58
2-5	Landing Pattern Diagram	59
3-1	Typical Arrangement of Emergency Equipment Stowage (3N, 3NM, and 3T)	69
3-2	Typical Arrangement of Emergency Equipment Stowage (3TM)	70
3-3	Emergency Exits and Entrance	71
3-4	Landing Gear Circuit Breaker	75
3-5	Landing Gear/Wing Flap Hand Crank	75
3-6	Landing Gear Clutch Pedal	75
3-7	Landing Gear Clutch, Teeth Engaged	76
3-8	Landing Gear Clutch, Teeth Disengaged	76
4-1	Instrument Markings (Sheet 1 of 2)	80
4-1	Instrument Markings (Sheet 2 of 2)	81
4-2	Take-off Distances	84
4-3	Climb Chart for Normal Power	85
4-4	Landing Distances	86
4-5	Maximum Endurance	87
4-6	Flight Operation Instruction Chart, Two Engines (Sheet 1 of 3)	88

LIST OF ILLUSTRATIONS (CONT'D)

FIGURE	TITLE	PAGE
4-6	Flight Operation Instruction Chart, Two Engines (Sheet 2 of 3)	89
4-6	Flight Operation Instruction Chart, Two Engines (Sheet 3 of 3)	90
4-7	Flight Operation Instruction Chart, One Engine (Sheet 1 of 3)	91
4-7	Flight Operation Instruction Chart, One Engine (Sheet 2 of 3)	92
4-7	Flight Operation Instruction Chart, One Engine (Sheet 3 of 3)	93
4-8	Position Error Correction Table	94
4-9	Engine Calibration Curve	95

PART 1

DESCRIPTION

GENERAL

1 This part describes the systems, controls and equipment of the Expeditor 3 aircraft. Each system is described, together with the controls that regulate or adjust the system. Expeditor 3 aircraft are described generally, with specific reference to the differences encountered in four configurations: the 3N, 3NM, 3TM and 3T.

INTRODUCTION

2 The Expeditor 3 is a twin-engine, low-wing, land monoplane of all-metal semi-monocoque design. Its empennage consists of one horizontal and two vertical stabilizers. The control surfaces are fabric covered.

3 Four versions of the Expeditor 3 appear in this Engineering Order, 3N, 3NM, 3T, and 3TM, the major difference being in their function. The Expeditor 3N and 3NM are used for training students in aerial navigation, whereas the Expeditor 3T and 3TM are primarily transport aircraft, capable of seating five passengers. In addition to this, 3T aircraft are used for pilot training. The two navigational training versions of the Expeditor can be distinguished from the two transport versions by the navigational astrodome in the roof, to the rear of the cockpit.

4 Expeditor 3NM contains identical furnishings to those of the Expeditor 3N i.e.: navigational equipment together with equipment stowage provisions, trainee's seats and tables, and the instructor's folding seat. (See Figure 1-1, General Arrangement of Expeditors 3N and 3NM). However, additional floor fittings are provided in the Expeditor 3NM so that navigational furnishings may be replaced by transportation furnishings to convert it to the 3TM version. The 3TM is normally fitted with transport type seats but has the necessary wiring, plumbing and fittings required to convert it to a 3NM navigational-training type aircraft. Transport furnishings include seating for five personnel, three dome lights which provide cabin illumination, and reading spot lights installed on the air ducts above each cabin seat. (See Figure 1-2, General Arrangement, Expeditor 3TM, and Figure 1-3, General Arrangement, Expeditor 3T).

5 Normal crew for the Expeditor 3 consists of a pilot and co-pilot. Dual controls are provided, although the aircraft can easily be flown solo.

6 Each power plant contains a Pratt and Whitney Wasp Junior, radial, air-cooled engine having nine cylinders in a single row. It has a maximum power rating at sea level of 450 hp at 2300 rpm, with a manifold pressure of 36 inches. The engine drives a two-bladed, fully-feathering, Hamilton Standard Hydromatic propeller through a direct shaft.

LEADING PARTICULARS

7 Following is a list of leading particulars covering the four versions of the Expeditor 3.

(a) Overall Dimensions:

Length	34 ft. 2-3/4 in.
Height	9 ft. 2-1/2 in.
Height (tail wheel on ground, propeller blades vertical, main U/C struts inflated to 2-1/2 in).	10 ft. 8-1/16 in.
Wing Span	47 ft. 7 in.

(b) Weight Data

	3N and 3NM	3T and 3TM
Approximate basic weight of aircraft	6300 lb	6500 lb
Maximum permissible take-off gross weight	9300 lb	9300 lb
Maximum permissible landing gross weight	9000 lb	9000 lb

Table 1-1 Weight Data

(c) Tank Capacities

FUEL TANKS		
Front Main - Left	63 Imp. gal	Gasoline 80/87 octane, Specification 3GP-25C
Front Main - Right	63 Imp. gal	
Rear Aux. - Left	21 Imp. gal	
Rear Aux. - Right	21 Imp. gal	
Nose Tank	67 Imp. gal	

CAUTION

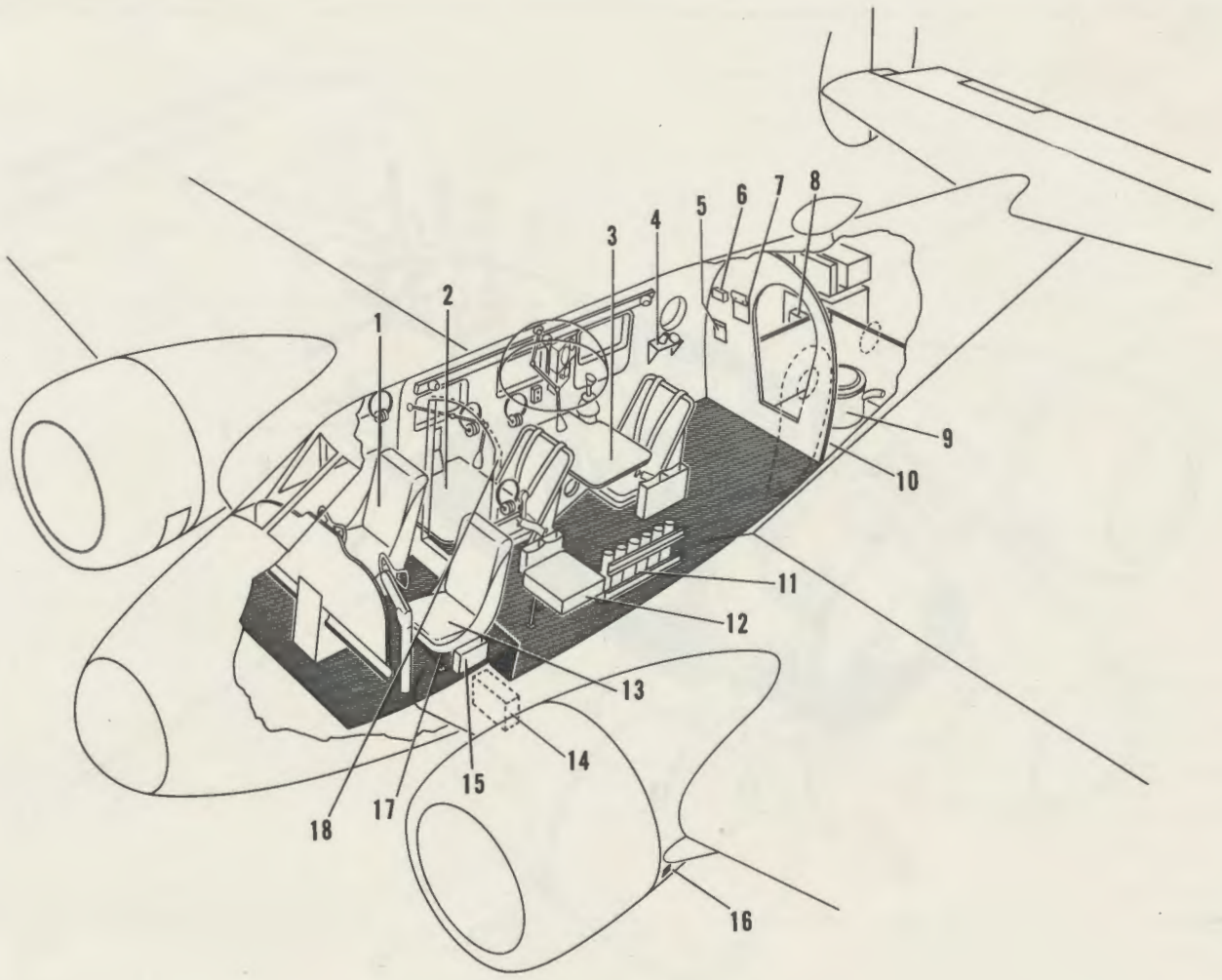
Limited 91/98, 100/130, 108/135. Emergency 115/145. Power restriction for limited and emergency fuels: operate at 1900 rpm or higher at 280-296 BHP (See EO 45-1-2).

OIL TANKS		
Left Nacelle	6.6 Imp. gal	Engine Oil Specification 3GP-100A
Right Nacelle	6.6 Imp. gal	

NOTE

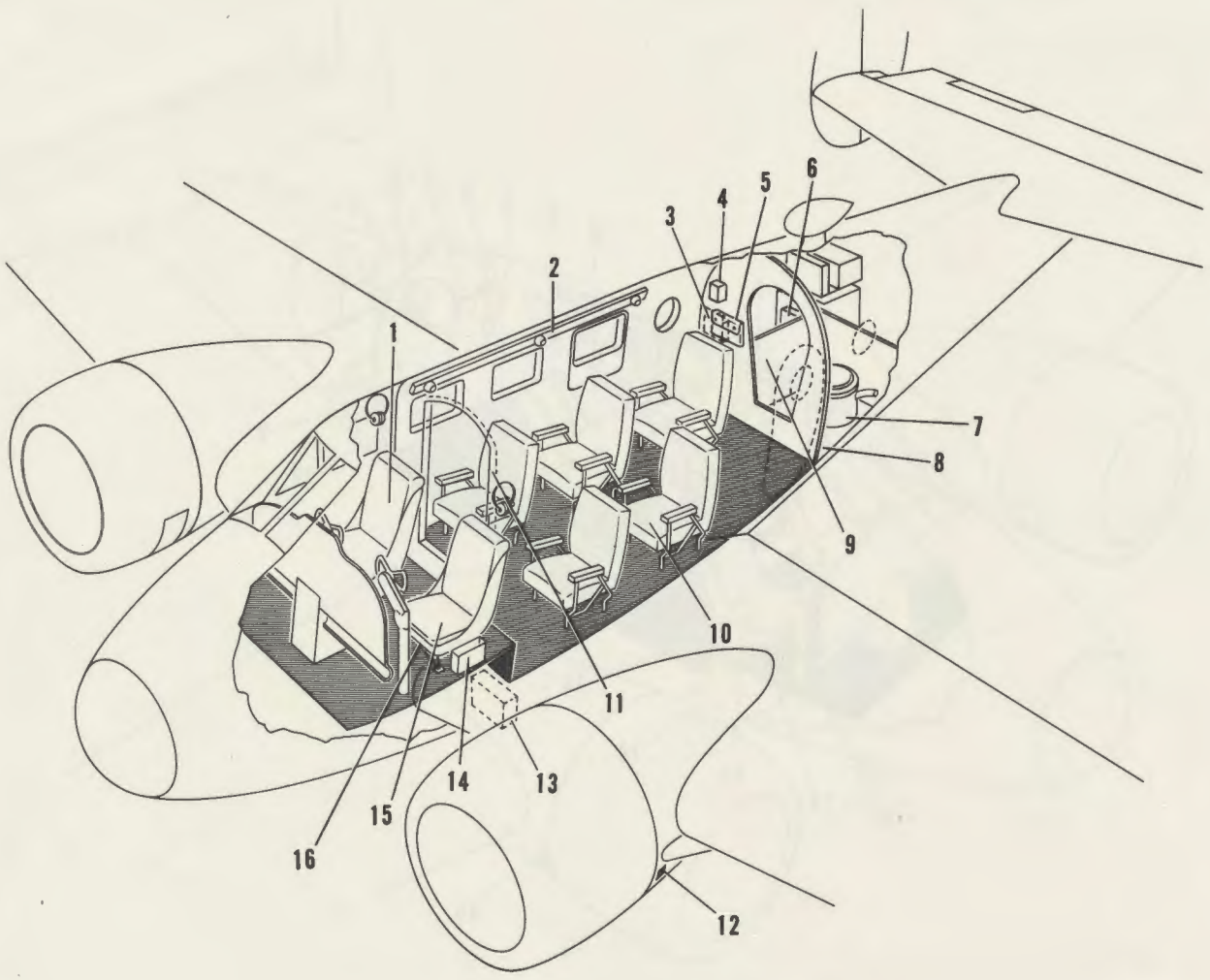
When the aircraft is in a nose high attitude, i.e.: on the ground or in a climb, because of the location of the fuel tank outlets, the usable fuel in each tank will be less than the quantity indicated on the gauge.

Table 1-2 Tank Capacities



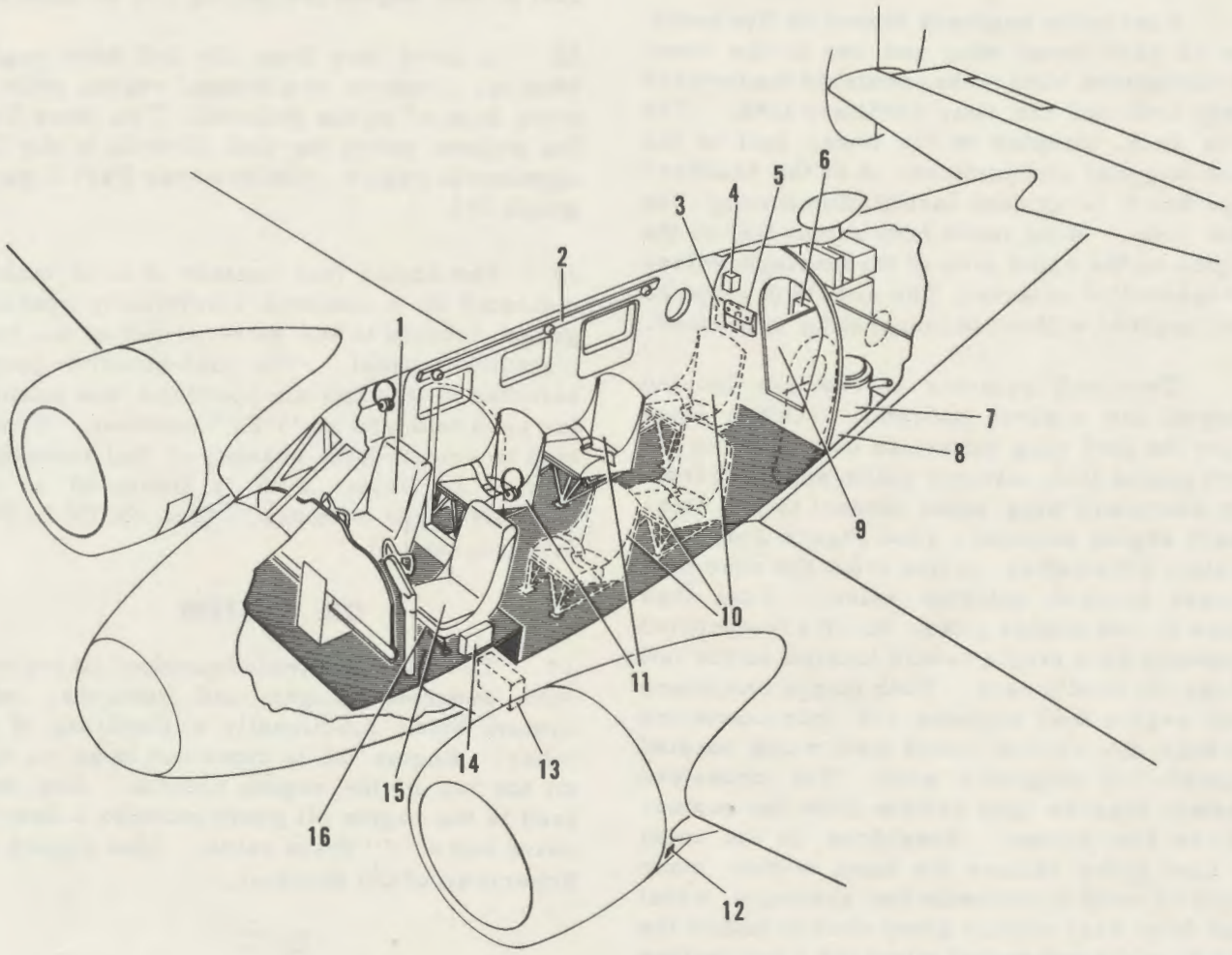
1 Co-pilot's Position
2 Forward Navigator's Position
3 Rear Navigator's Position
4 B5 Drift Recorder
5 Battery Card Holder
6 Spare Bulb Container
7 Forced Landing Instructions Bag
8 Data Case (Rear Baggage Compartment)
9 Chemical Toilet
10 Relief Tube
11 Flare Stowage
12 Navigation Instructor's Position
13 Pilot's Position
14 Internal Battery (Both Leading Edges)
15 Map and Data Case
16 External Power Receptacle
17 Pilot's Relief Tube
18 Cockpit-Cabin Partitioning Curtain

Figure 1-1 General Arrangement Diagram, Expeditors 3N and 3NM



1 Co-pilot's Position
2 Cabin Cold Air Duct
3 Battery Card Holder (Rear of No. 9 Bulkhead)
4 Spare Bulb Container
5 Forced Landing Instructions Bag
6 Data Case (Rear Baggage Compartment)
7 Chemical Toilet
8 Relief Tube
9 Rear Baggage Compartment
10 Reclining Cabin Seats (Five Passengers)
11 Cockpit-Cabin Partitioning Curtain
12 External Power Receptacle
13 Internal Battery (Both Leading Edges)
14 Map and Data Case
15 Pilot's Position
16 Pilot's Relief Tube

Figure 1-2 General Arrangement Diagram, Expeditor 3TM



1 Co-pilot's Position
2 Cabin Cold Air Duct
3 Battery Card Holder (Rear of No. 9 Bulkhead)
4 Spare Bulb Container
5 Forced Landing Instructions Bag
6 Data Case (Rear Baggage Compartment)
7 Chemical Toilet
8 Relief Tube
9 Rear Baggage Compartment
10 Optional Cabin Seats (not normally installed in the 3T configuration)
11 Permanent Cabin Seats
12 External Power Receptacle
13 Internal Battery (Both Leading Edges)
14 Map and Data Case
15 Pilot's Position
16 Pilot's Relief Tube

Figure 1-3 General Arrangement Diagram, Expeditor 3T

FUEL SYSTEM

8 Fuel to the engine is stored in five tanks, two in each inner wing and one in the nose. The aluminum wing tanks consist of the forward main tank and the rear auxiliary tank. The nose tank, situated in the lower half of the nose baggage compartment is of the bladder-type which facilitates installation through the nose door. Wing tanks only supply fuel to the engine on the same side of the fuselage, unless 'crossfeed' is selected. The nose tank supplies both engines without incorporating crossfeed.

9 Two tank selector valves are located beneath the control pedestal. Outlet lines from the port wing tanks are connected to the port engine tank selector valve, and lines from the starboard wing tanks connect to the starboard engine selector. (See Figure 1-4, Fuel System Schematic). A line from the nose tank passes to each selector valve. Fuel then flows to two wobble pumps which are operated manually by a single handle located to the left of the co-pilot's seat. Both pumps and hence both engine fuel systems are interconnected through the suction cross feed valve located beneath the co-pilot's seat. The crossfeed system depends upon suction from the engine-driven fuel pumps. Therefore, in the event of fuel pump failure the hand wobble pump must be used to maintain fuel pressure. A fuel line from each wobble pump runs to either the left or right engine fuel pump via a non-return valve and a fuel strainer.

10 In each power plant, fuel under pressure, ranging from 3 to 5 psi depending on engine operating conditions, is supplied by the fuel pump to the carburettor. Auxiliary lines from the carburettor run to a fuel pressure warning switch, (which operates the warning light in the cockpit), to the fuel pressure gauge, and to the oil dilution solenoid. The solenoid outlet is connected to the oil "Y" drain valve, (See Figure 1-4).

11 A second solenoid, fitted behind each engine bulkhead allows fuel under pressure to enter the line between the oil tank and the propeller feathering pump thereby diluting the oil used for feathering. The fuel for this purpose comes from the line connecting the wobble pump to the right hand engine strainer, and goes to a Plessey pump located in the right hand wheel well. This single pump sends the fuel to both engine feathering line solenoids.

12 A third line from the left hand engine strainer connects to a manual engine priming pump located on the pedestal. Two lines from the primer carry the fuel directly to the five uppermost engine cylinders (see Part 1, paragraph 59).

13 The actual fuel content of each tank is indicated on a common electrically-operated gauge, located to the extreme left of the main instrument panel. The fuel-quantity-gauge-selector switch has six positions, one position for each tank and an "OFF" position. When a tank is selected, the quantity of fuel remaining in that particular tank is indicated on the contents gauge in tenths. (See NOTE in Part 1, paragraph 7).

OIL SYSTEM

14 The engines have independent oil systems with separate gauges and controls, each system being functionally a duplicate of the other. Engine oil is contained in an oil tank on the top of the engine nacelle. The main feed to the engine oil pump includes a shut-off valve and a "Y" drain valve. (See Figure 1-5 Schematic of Oil System).

NOTE

In the event of loss of oil through a broken line, a stand pipe arrangement in the oil tank retains sufficient oil for feathering purposes.

OIL SHUT-OFF VALVE

15 The oil shut-off valve controls for both engines are located on the pedestal on each side of the engine primer.

NOTE

The oil shut-off valve is not incorporated on 3T type aircraft.

OIL BY-PASS VALVE

16 Oil returns to the tank from the engine scavenger pump via the cooling radiator.

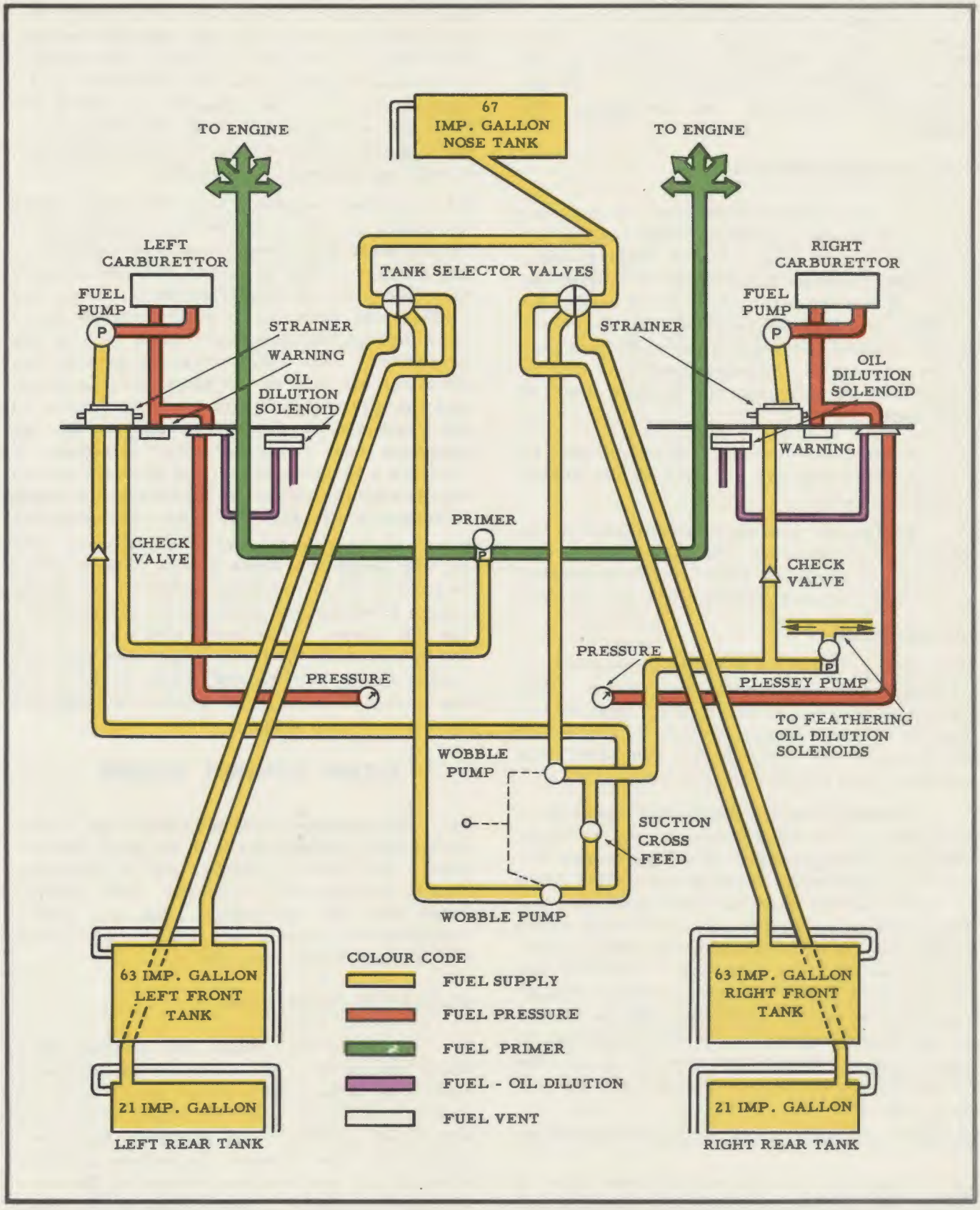


Figure 1-4 Fuel System, Schematic Diagram

When cooling is not required, the oil can by-pass the radiator through a by-pass valve. The control for this valve is located on the pedestal above the engine primer. In the "PULL-HOT" position oil by-passes the radiator.

OIL COOLING SHUTTER

17 The oil radiator is mounted on the forward face of the firewall. The cooling air enters a duct in each inboard leading edge, and passes through the radiator core from the rear. A shutter within the ducting varies the air flow, which is adjusted by the oil cooler shutter controls located on the right hand side of the pedestal. Selected positions can be maintained by applying the friction lock at their base.

18 Venting the oil tank is accomplished by a line connecting the oil tank to the engine accessory casing.

19 Engine oil pressure is indicated on the multiple fuel pressure, oil temperature, and oil pressure gauge. A restrictor incorporated in the line prevents fluctuation of the needle.

OIL DILUTION

20 During oil dilution, fuel enters the oil "Y" drain while the engine is running. (See Part 2 paragraph 77 for dilution procedure). The oil dilution control switches, located on the extreme left of the pilot's sub-panel, are spring-loaded toggle switches.

21 Except when the feathering pump is in operation, oil in the feathering line is static and will possibly congeal at temperatures below 0°C. Similarly, oil in the propeller dome is static after the propeller has been feathered. The oil dilution switch mounted on top of the main instrument panel, outboard of the feathering buttons, has two positions, "WINTER" and "SUMMER". With the switch in the "WINTER" position, the oil for feathering will be diluted automatically when the feathering button is depressed. When the switch is in the "SUMMER" position, feathering oil dilution does not occur.

PROPELLER FEATHERING AND GOVERNING

22 Propeller pitch is varied from 'fine' to 'coarse' by oil pressure supplied by a constant speed unit. Engine oil is fed to the CSU pump which supplies oil to one side of the propeller pitch varying piston via a distributing adapter. (See Figure 1-5, Oil System Schematic). Variations of pitch in the other direction (i.e. 'coarse' to 'fine') is achieved by engine oil pressure, acting on the other side of the pitch varying piston, assisting the normal centrifugal twisting moment of the blades.

23 A line branching from the main engine oil supply passes to the feathering pump which in turn feeds high pressure oil to the distributing adapter. The pressure actuates a valve that closes the oil line from the governor and at the same time allows high pressure oil to pass through the governor supply line to the propeller. This extra pressure acts on the governor oil side of the pitch varying piston and changes the pitch through 'fully coarse' to the 'feathered' position. As soon as the oil pressure has completed this selection, it actuates a differential cut-out switch fitted to the distributing valve, and the feathering motor is automatically shut off. When the feathering button is selected for a second time, and held in, the propeller dome sleeve moves backwards and directs the high pressure oil to the engine oil side of the piston, thereby unfeathering the blades. The feathering motor is cut out by releasing the feathering button when the blades reach the 'coarse' pitch position and the governor takes over control through the 'coarse - fine' range.

FLYING CONTROL SYSTEM

24 Conventional control column and rudder pedals are provided for both the pilot and co-pilot. All control surfaces are of aluminum frame construction, covered with fabric. Trim tabs are adjustable from the pilot's compartment and each tab control is provided with a tab position indicator.

ELEVATOR TRIM TABS

25 Elevator trim tabs are adjusted by a wheel mounted on the bulkhead at the lower right side of the pilot's seat. (See Figure 1-6 Pilot's Position). Roll the wheel forward for nose-down position, and backward for nose-up position. The elevator tab position indicator (electrically operated) is located on the main instrument panel. (See Figure 1-17, Main Instrument Panel).

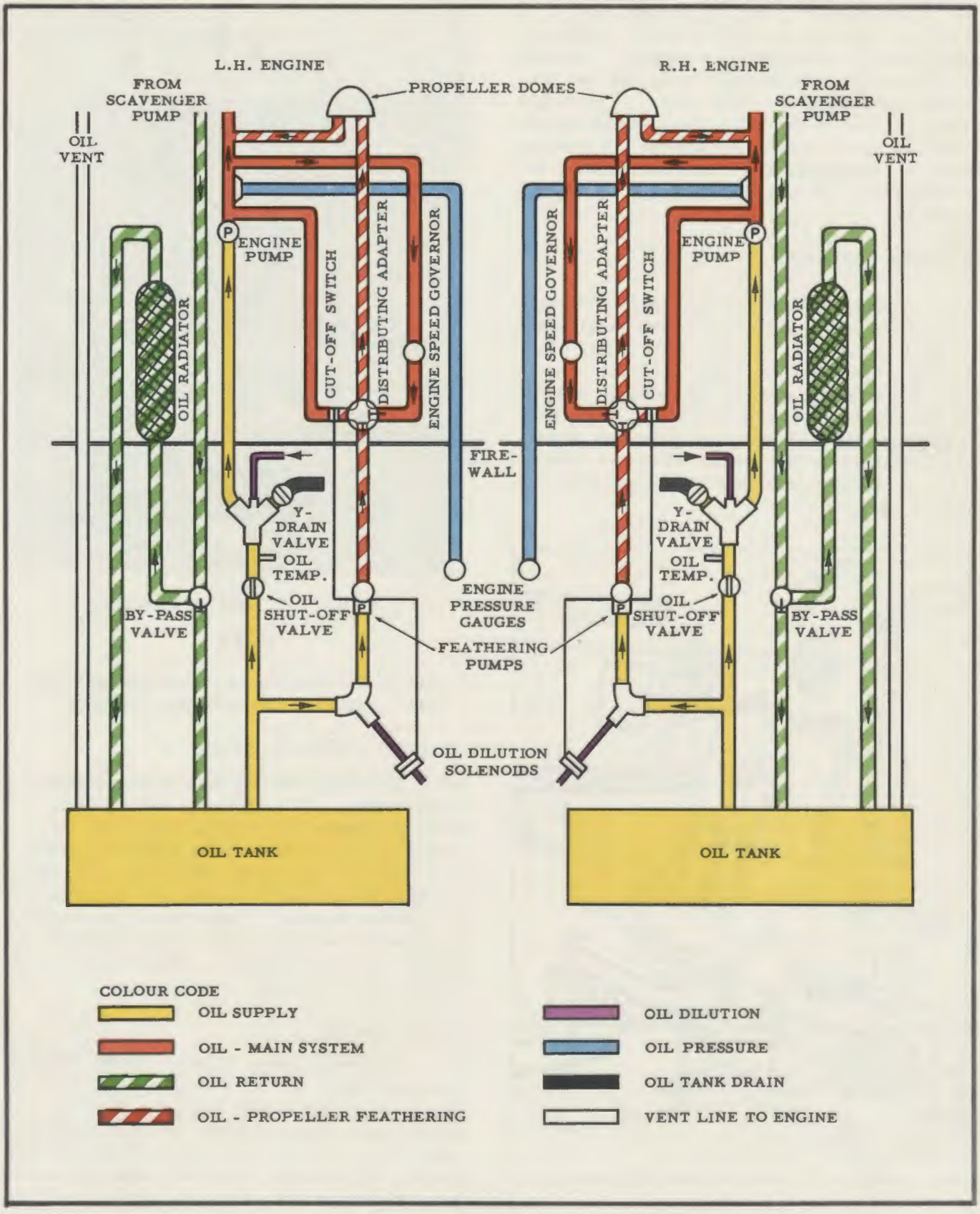


Figure 1-5 Oil System, Schematic Diagram

26 The aileron trim tab is adjusted by a wheel in the centre of the control pedestal. (See Figure 1-7, Control Pedestal). Turning it clockwise lowers the right wing and counter-clockwise lowers the left wing. The single tab is located on the left aileron and is visible from the pilot's seat. An aileron tab position indicator (mechanically operated) is mounted immediately above the aileron trim tab control.

RUDDER TRIM TAB

27 A crank, located in the centre and to the rear of the overhead radio control panel in the cockpit, adjusts the rudder trim tabs. (See Figure 1-32, Master Radio Control Panel). The direction of turn is indicated by arrows on the crank supporting bracket. A mechanically-operated tab position indicator is located adjacent to the rudder trim tab crank. The left rudder trim tab is visible from the pilot's seat.

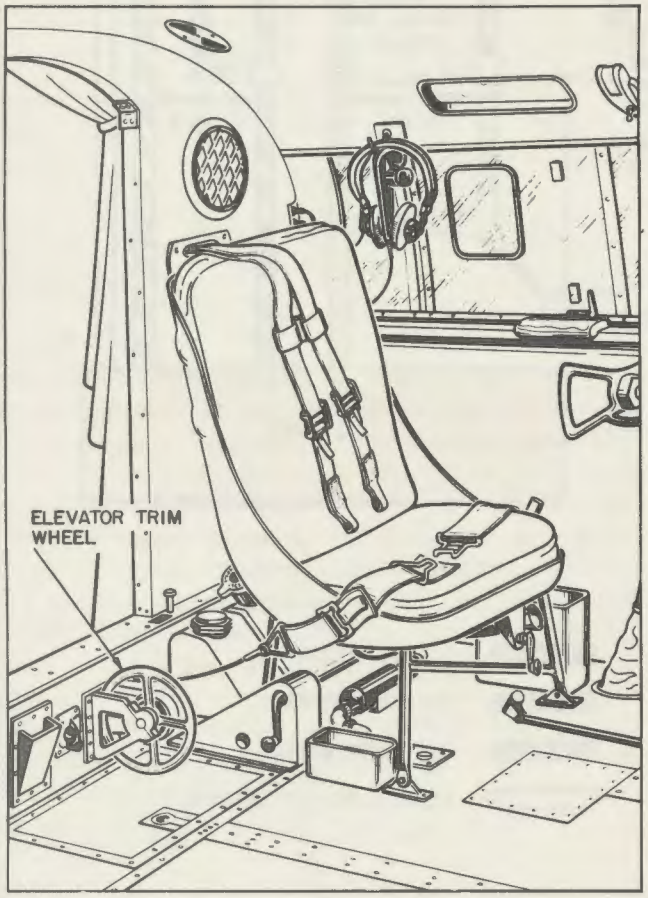


Figure 1-6 Pilot's Position

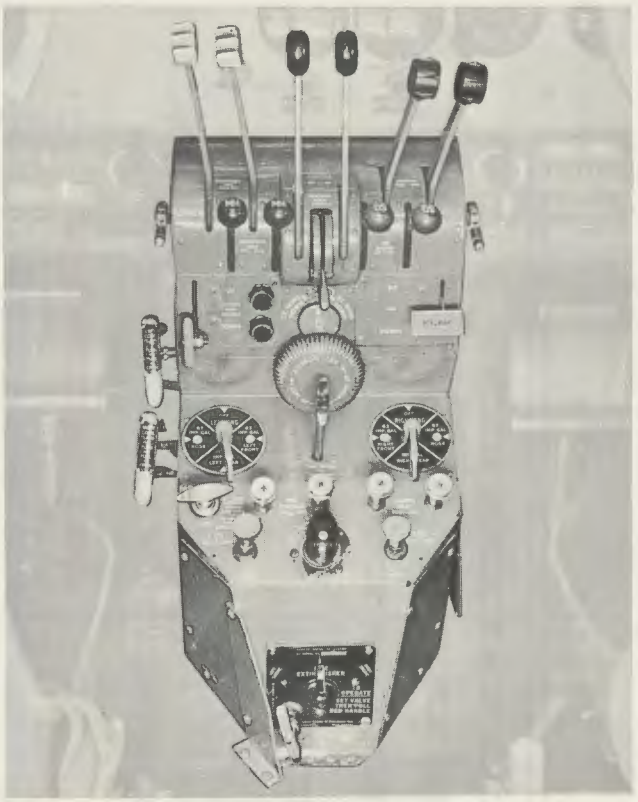


Figure 1-7 Control Pedestal

NOTE

On 3T aircraft there is one rudder trim tab, located on the left hand rudder.

FLIGHT CONTROL LOCK

28 The flight control lock, of fabricated red steel tubing, secures the rudder pedals and control column in such a way that control surfaces are locked in a neutral position. The lock is used only when the aircraft is parked, to prevent damage to controls and adjacent equipment. When not in use the lock is stowed on the cockpit floor between the pilot's rudder pedals. (See Figure 1-8, Flight Control Lock).

WING FLAPS

29 The wing flaps, located on the inboard trailing edge, are of aluminum frame construction covered with fabric. A protective scuff plate is incorporated covering the leading edge, the underside of the flap and the trailing edge. It provides protection against engine exhaust vapour and debris thrown by the main wheels.

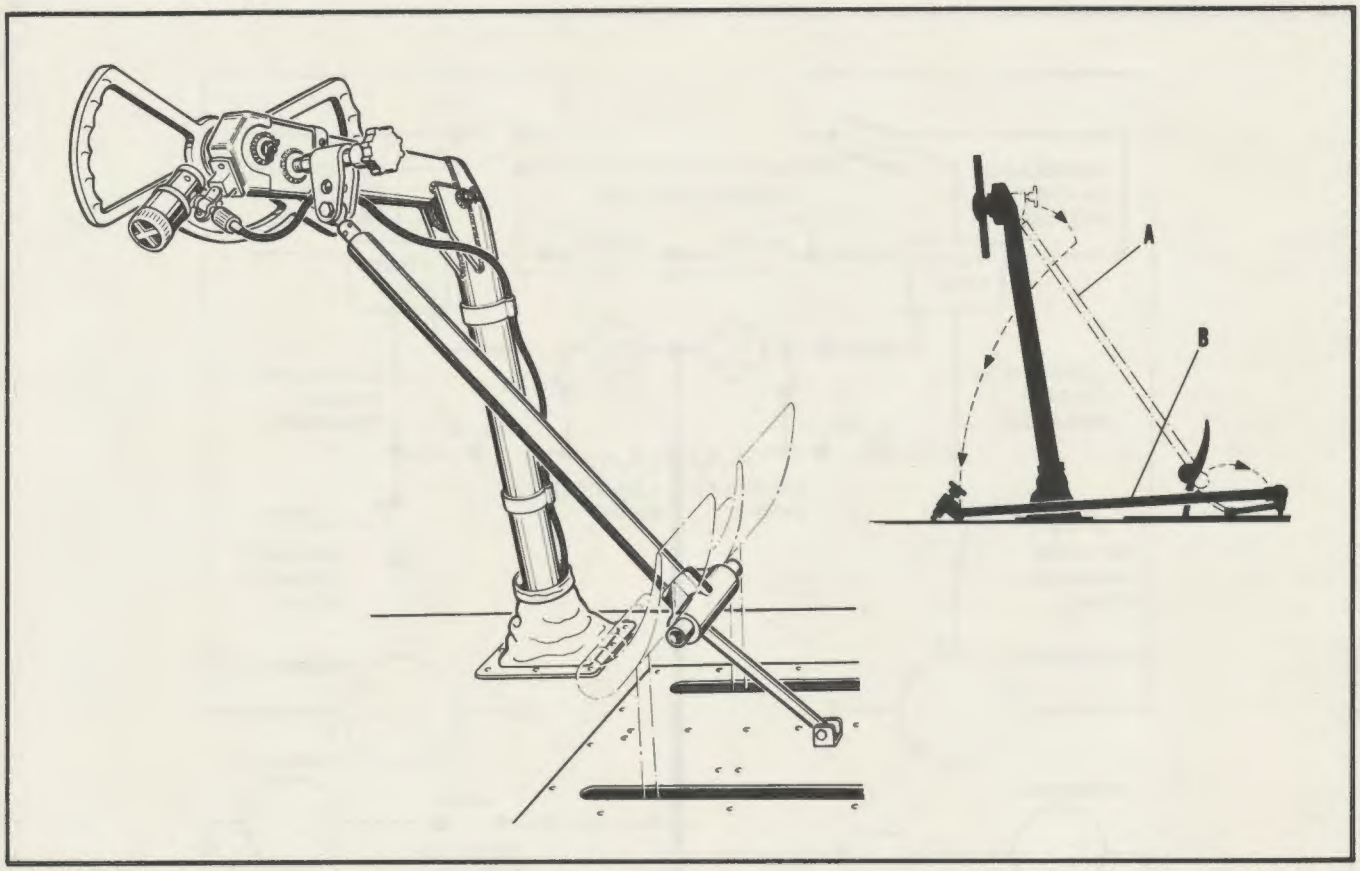


Figure 1-8 Flight Control Lock

30 The flaps operate through an angle of 45 degrees, below the neutral ("UP") position. Power for moving them is supplied to a torsion shaft by an electric motor. Varying flap positions are maintained using a dynamic brake.

31 The flap control lever, located on the vertical portion of the pedestal has three positions: "UP" "OFF" and "DOWN". (See Figure 1-7, Control Pedestal). For normal operation of the flaps the lever is moved to the "DOWN" position to lower them, and to the "UP" position to raise them. To move the lever from either the "UP" or the "DOWN" position, it must first be pulled out and then moved to the desired position. However the lever can be moved from the "OFF" position by applying a direct up or down force. A small indentation in the guide gives the lever a positive "OFF" location.

32 As the flap moves through its range, its position is indicated on an electrical flap position indicator located on the pilot's side of the main instrument panel. (See Figure 1-17). Intermediate angles of flap declination can be obtained as follows:

(a) The flaps are set in motion by moving the lever in the appropriate direction, either up or down.

(b) The flaps are stopped by the dynamic brake, at the desired angle, by returning the lever to the "OFF" position.

HYDRAULIC SYSTEM

33 The brake system is the only system on the Expeditor 3 that is operated hydraulically. The hydraulic system, therefore, is described in conjunction with brake operation in Part 1, paragraph 70. Fluid to be used for this purpose is hydraulic fluid specification 3-GP-26a.

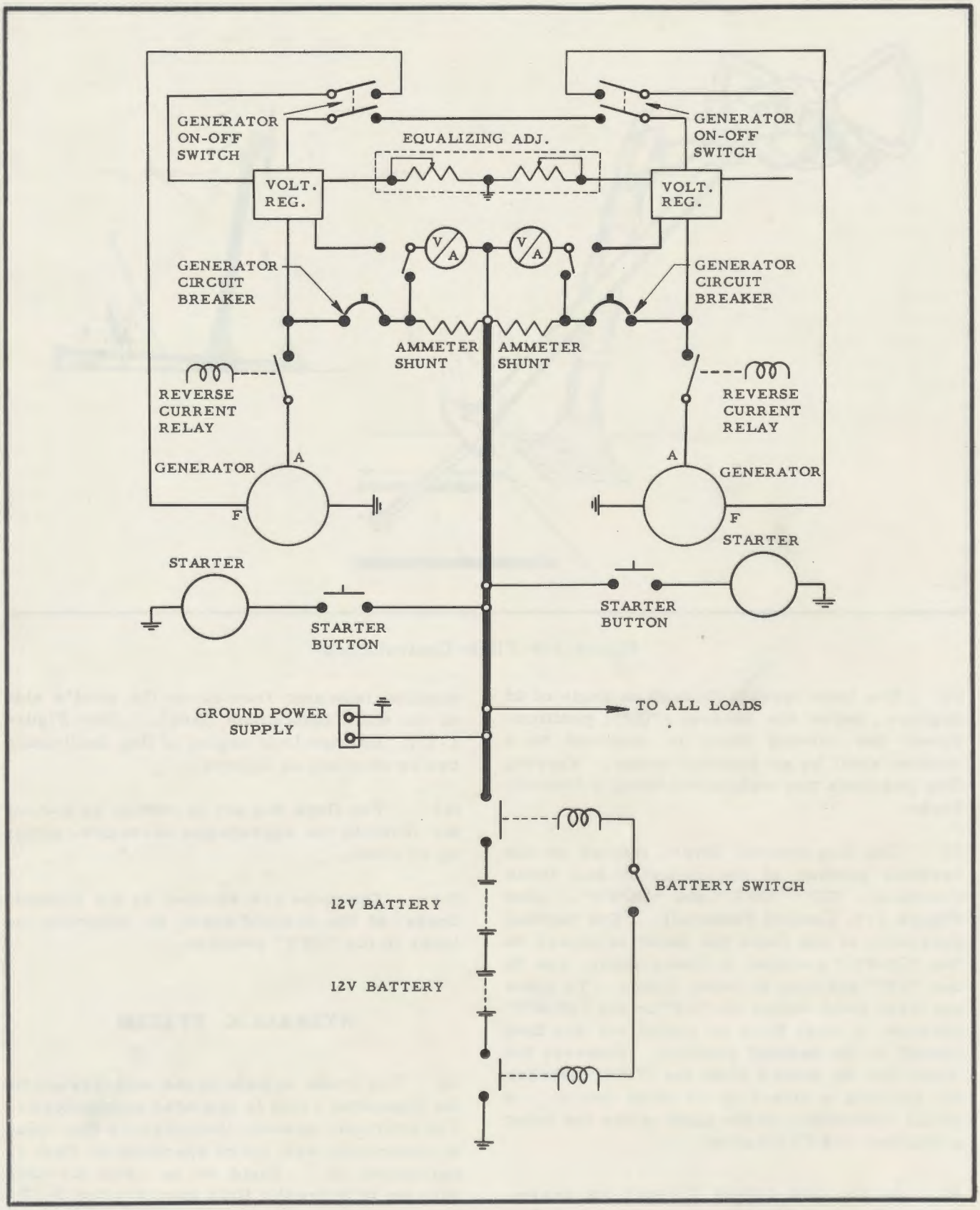


Figure 1-9 Electrical Power Supply, Schematic Diagram

ELECTRICAL SYSTEM

POWER SUPPLY

34 The aircraft is equipped with 28 volt d-c, single wire, ground return circuitry that carries energy for electrically-operated systems and accessories. (See Figure 1-9, Schematic of Electrical Power Supply). The primary power source consists of two 100 ampere, engine-driven generators, one mounted on each power plant. The power supply is supplemented by two 12-volt batteries connected in series. With the engines running, the generators supply the necessary power to satisfy the system and to maintain battery charging.

35 Equipment throughout the aircraft is designed to operate between 22 and 29 volts. The majority of the instruments work with an optimum efficiency at 27.5 volts. Voltage regulators within the system maintain the supply at 28 volts so that each piece of equipment, considering line drop, is operated at 27.5 volts. Two inverters, incorporated in the circuitry, supply alternating current to operate the radio compass, the C2 compass, and the drift recorder light, and the gyro horizon indicator.

36 If one generator fails, the other generator is capable of maintaining the necessary supply for operating the system with the exception of propeller unfeathering. When unfeathering, an initial load of 200 amperes is placed on the circuit. The operating generator is capable of supplying 100 amperes, but for the short period of unfeathering, the batteries are able to make up the deficiency. Two generator failure warning lights, one for each generator, are located below the engine temperature gauges on the main instrument panel.

37 To provide a convenient means of adjusting the electrical system voltage from within the aircraft, two voltage regulator control rheostats are mounted within a box on the upper rear face of the main spar bulkhead (On 3T type aircraft the controls are mounted within each relay box, located on the lower rear face of the main spar bulkhead). Initial adjustment of the voltage is carried out externally by ground personnel, and fine adjustment is accomplished in flight by adjusting the two slot-headed rheostat shafts in the regulator box.

EXTERNAL POWER FACILITIES

38 A receptacle, located on the outboard side of the left engine nacelle beneath a small hinged plate marked "EXTERNAL POWER 24 VOLT", enables an external ground power source to be connected to the circuit for engine

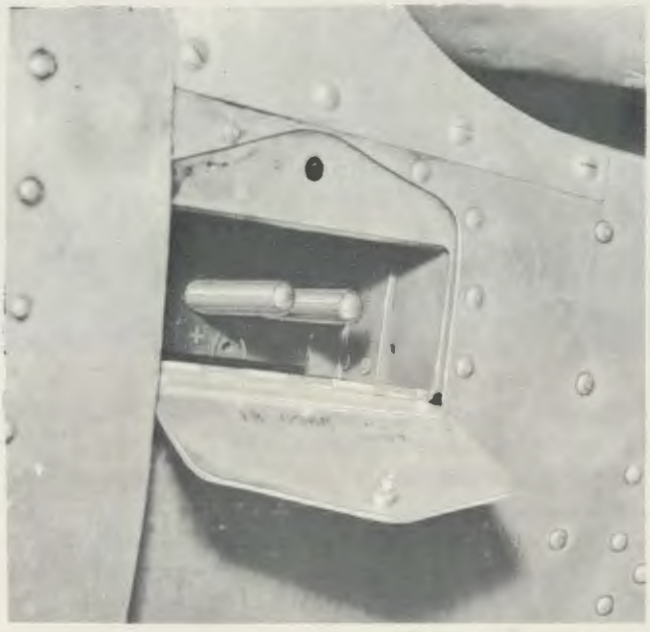


Figure 1-10 External Power Receptacle

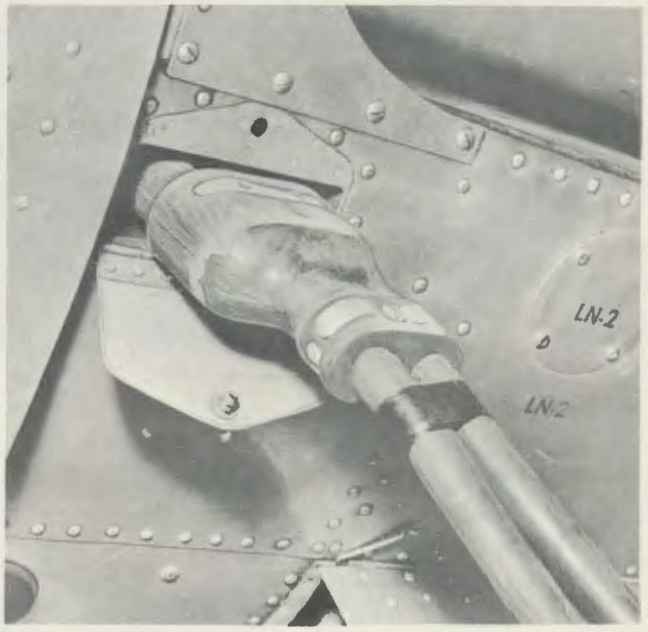


Figure 1-11 External Power Connected

starting, and to energize aircraft services. (See Figure 1-10, External Power Receptacle).

CAUTION

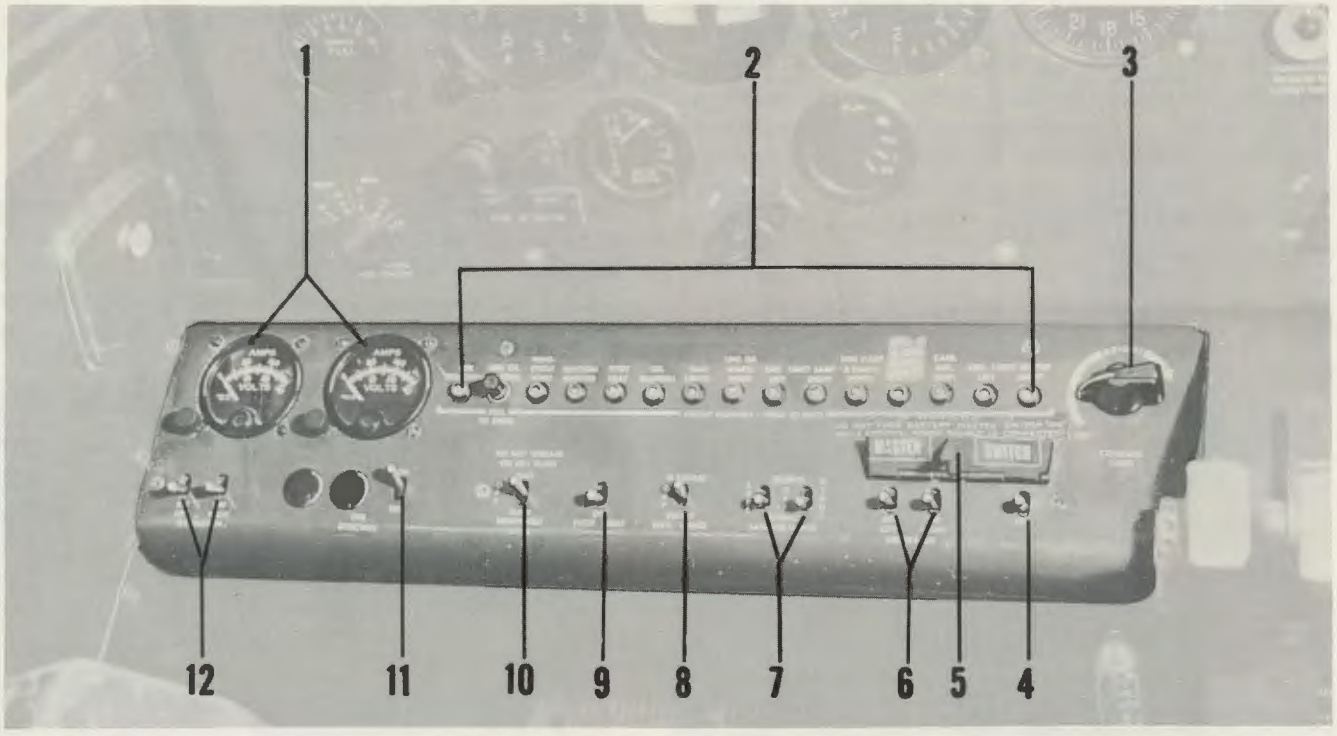
The battery switch must be in the "OFF" position when external power is being used.

POWER SUPPLY CONTROLS

39 The battery switch mounted on the left sub-panel completes the circuit between the batteries and the bus. (See Figure 1-12, Pilot's Sub-panel). Moving the switch to the "ON" position allows the batteries to be charged by the generators, or alternatively, allows the batteries to supplement the generator supply.

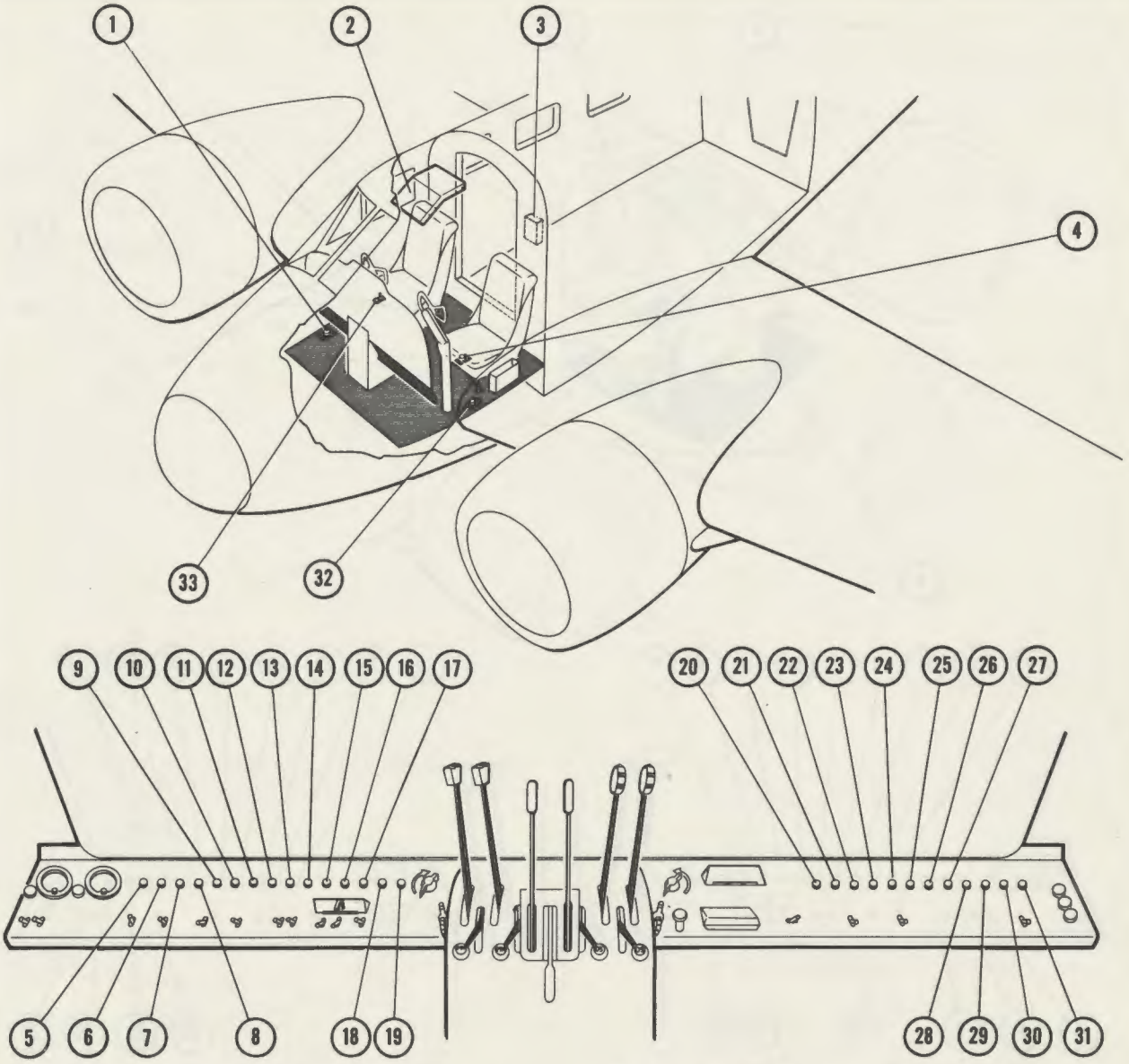
40 The generator "on-OFF" switches are located on the left sub-panel immediately outboard of the battery switch. When the engines are running, both generator switches must be on before the full supply is available to aircraft facilities. The two generator switches and the battery switch can be reset in the "OFF" position with a single action, by operating the master switch throwbar.

41 Two volt-ammeters, fitted to the left sub-panel, normally act as ammeters and indicate the generator current. When the button on the rim of the instrument is depressed, the instruments are converted to voltmeters and the needles indicate generator output voltage. The generator volt-ammeters will operate only when the appropriate generator switch is closed. ("on").



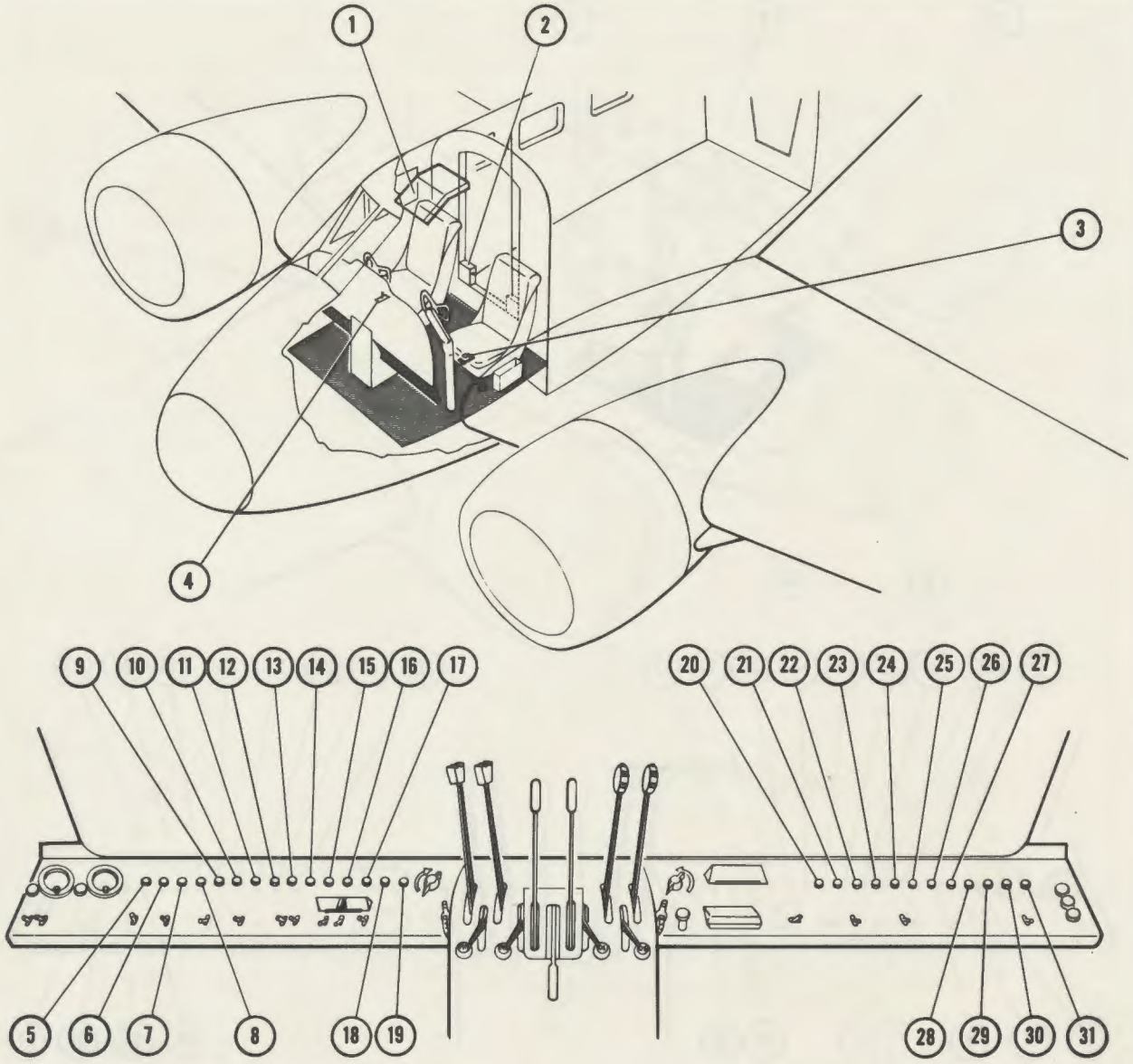
1. Volt - Ammeters (LH & RH)
2. Circuit Breakers
3. Compass Light Rheostat
4. Master Battery Switch
5. Master Switch Throwbar
6. Generator Switches
7. Landing Light Switches
8. Navigation Lights Switch
9. Pitot Heat Switch
10. Windshield Wiper Switch
11. Fire Detection Warning Lights Test Switch
12. Oil Dilution Switches

Figure 1-12 Pilot's Sub-Panel



1. Generator, Right Engine (105 Amp)
2. Radio Control Panel
3. Generator Voltage Control Box
4. Landing Gear (50 Amp)
5. Fire Detection (5 Amp)
6. Landing Gear Control (10 Amp)
7. Windshield Wiper (15 Amp)
8. Ignition Booster (10 Amp)
9. Pitot Heat (20 Amp)
10. Oil Dilution (15 Amp)
11. Navigation Lights (10 Amp)
12. Landing Gear Warning Horn (10 Amp)
13. Left Landing Light Lamp (30 Amp)
14. Right Landing Light Lamp (30 Amp)
15. Fuel Gauge and Warning Lights (10 Amp)
16. Landing Gear Position and Generator Warning Lights (10 Amp)
17. Carburettor Mixture Temperature (10 Amp)
18. Left Landing Light Motor (10 Amp)
19. Right Landing Light Motor (10 Amp)
20. Anti-Icer Motor (10 Amp)
21. Fluorescent and Instrument Lights (10 Amp)
22. Flap and Elevator Tab Position Indicators (10 Amp)
23. De-Icer (10 Amp)
24. Cabin and Reading Lights (10 Amp)
25. Flap Motor (20 Amp)
26. Left Oil Temperature (10 Amp)
27. Right Oil Temperature (10 Amp)
28. Air Mileage Unit (5 Amp)
29. Gyrosyn Compass DC Power (10 Amp)
30. Bank and Turn Indicator (5 Amp)
31. Inverter (20 Amp)
32. Generator, Left Engine (105 Amp)
33. Propeller Feathering (5 Amp)

Figure 1-13 Circuit Breaker and Junction Box Diagram (3N, 3NM and 3TM)



1. Radio Control Panel
2. Generator Control Box and Circuit Breaker (105 Amp)
3. Landing Gear (50 Amp)
4. Propeller Feathering (5 Amp)
5. Fire Detection (5 Amp)
6. Landing Gear Control (10 Amp)
7. Windshield Wiper (15 Amp)
8. Ignition Booster (10 Amp)
9. Pitot Heat (20 Amp)
10. Oil Dilution (15 Amp)
11. Navigation Lights (10 Amp)
12. Landing Gear Warning Horn (10 Amp)
13. Left Landing Light Lamp (30 Amp)
14. Right Landing Light Lamp (30 Amp)
15. Fuel Gauge and Warning Lights (10 Amp)
16. Landing Gear Position and Generator Warning Lights (10 Amp)
17. Carburettor Mixture Temperature (10 Amp)
18. Left Landing Light Motor (10 Amp)
19. Right Landing Light Motor (10 Amp)
20. Anti-Icer Motor (10 Amp)
21. Fluorescent and Instrument Lights (10 Amp)
22. Flap and Elevator Tab Position Indicators (10 Amp)
23. De-Icer (10 Amp)
24. Cabin and Reading Lights (10 Amp)
25. Flap Motor (20 Amp)
26. Left Oil Temperature (10 Amp)
27. Right Oil Temperature (10 Amp)
28. Unused
29. Gyrosyn Compass DC Power (10 Amp)
30. Bank and Turn Indicator (5 Amp)
31. Inverter (20 Amp)

Figure 1-14 Circuit Breaker and Junction Box Diagram (3T)

CIRCUIT BREAKERS

42 Each individual electrical circuit contains a circuit breaker to protect the system against overload. See Figures 1-13 and 1-14 (Circuit Breaker and Junction Box Diagrams) for their location. All circuit breakers, with the exception of the propeller feathering control and the landing gear control, are of the "push to reset" type. The propeller feathering control system incorporates a circuit breaker toggle switch adjacent to the feathering buttons. The landing gear control circuit breaker is of the "pull-to-open" type and in addition to protecting the circuit against overload, it can be pulled out to disconnect the system. (See part 3, paragraph 21, Landing Gear Emergency Operation).

NOTE

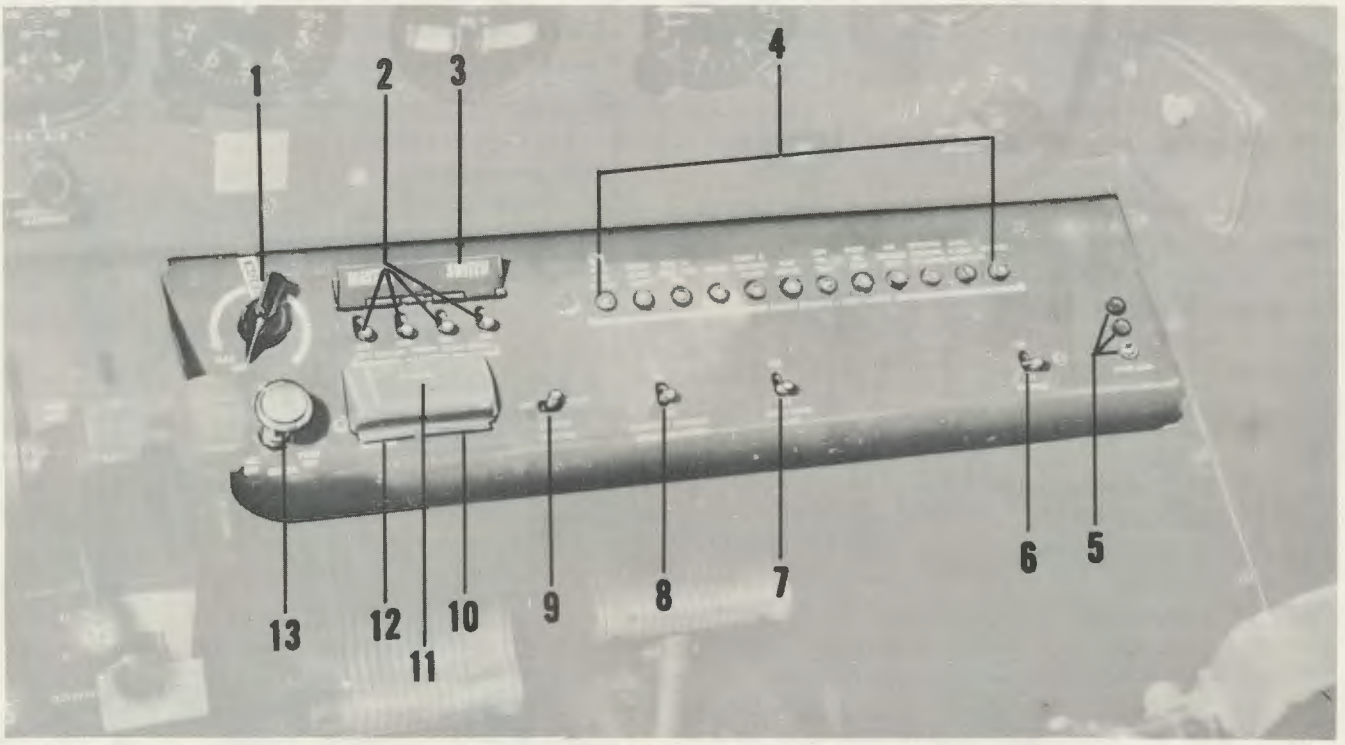
"Push to reset" circuit breakers must have a minimum cooling period of one minute before they can be reset.

SPARE BULBS

43 Spare bulbs for aircraft lighting are carried in a plain sheet metal case mounted on the forward face of the rear cabin bulkhead. A chart within its lid identifies the bulb functions.

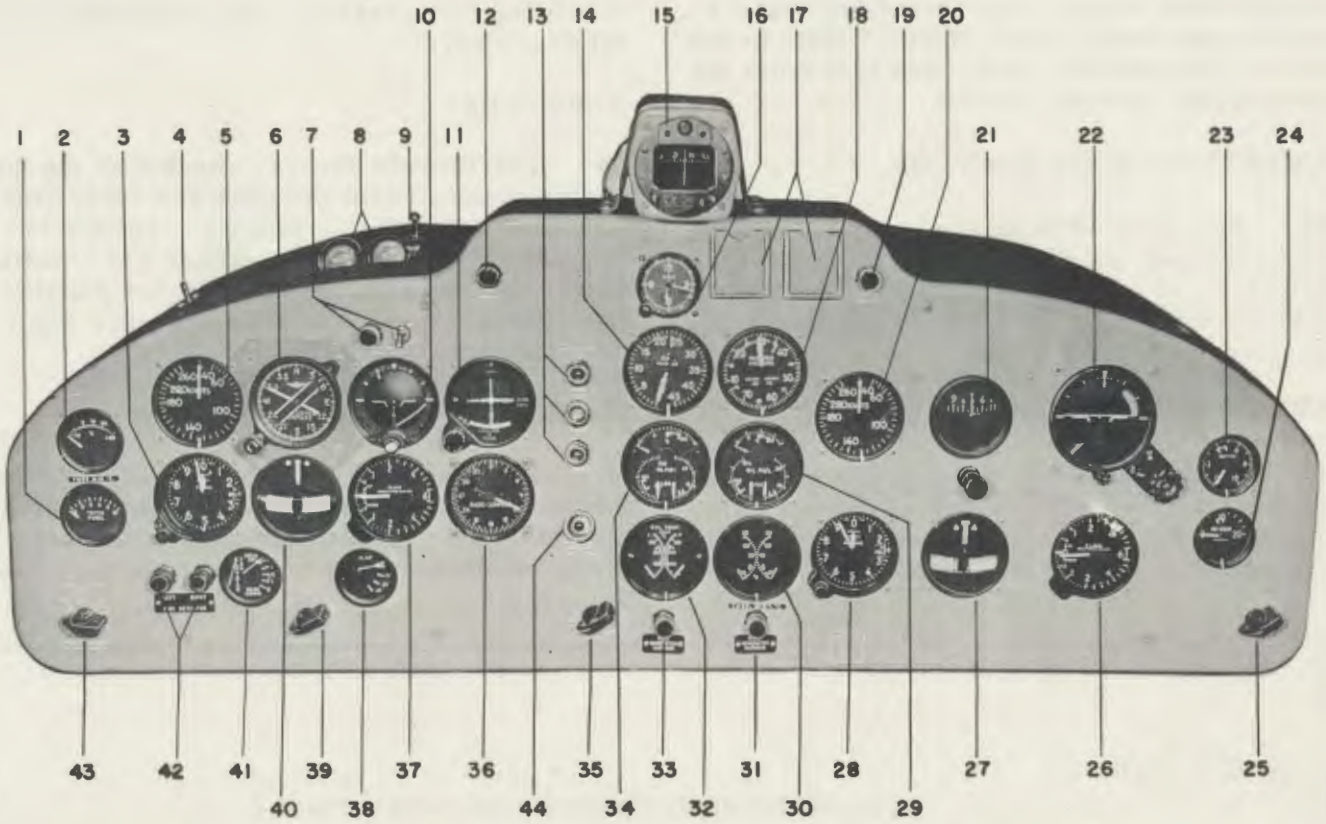
VACUUM SYSTEM

44 Three gyro instruments on the co-pilot's instrument panel, the artificial horizon, the turn and bank indicator, and the directional



1. Anti-Icer Rheostat
2. Master Ignition Switches
3. Master Ignition Switches Throwbar
4. Circuit Breakers
5. Spare Bulbs
6. Inverter Switch
7. Cabin Dome Light Switch
8. Gyrosyn Compass De-Slaving Switch
9. Starter Selector Switch
10. Starter Switch (Under Hinged Cover)
11. Starter and Booster Switch Cover
12. Ignition Booster Switch (Under Hinged Cover)
13. De-Icer Control

Figure 1-15 Co-Pilot's Sub-Panel



1 Fuel Quantity Gauge
2 Outside Air Temperature
3 Altimeter
4 Summer/Winter Feathering Dilution Switch
5 Airspeed Indicator
6 Gyrosyn Compass
7 Gyro Horizon Erection Switch and Indicator Light
8 Propeller Feathering Buttons
9 Propeller Feathering Circuit Breaker
10 Gyro Horizon Indicator
11 ILS Indicator
12 Fuel Pressure Warning Light
13 Marker Beacon Lights
14 RPM Indicators (Tachometers)
15 B16 Compass
16 Clock
17 Compass Correction Card Holders
18 Manifold Pressure Gauge
19 Fuel Pressure Warning Light
20 Airspeed Indicator
21 Directional Gyro Indicator
22 Gyro Horizon Indicator
23 Suction Gauge
24 De-Icing Pressure Gauge
25 Instrument Light Rheostat Switch
26 Rate of Climb Indicator
27 Turn and Bank Indicator
28 Altimeter
29 Engine Gauge Unit
30 Carburettor Mixture Temperature Gauge
31 Generator Failure Warning Light
32 Cylinder Head Temperature Gauge
33 Generator Failure Warning Light
34 Engine Gauge Unit
35 Instrument Light Switch
36 Radio Compass Indicator
37 Rate of Climb Indicator
38 Flap Position Indicator
39 Instrument Light Switch
40 Turn and Bank Indicator
41 Elevator Tab Position Indicator
42 Fire Detection Warning Lights
43 Fuel Gauge Selector Switch

Figure 1-17 Main Instrument Panel

"FULL RICH" and fully aft or "Idle cut-off". Progressive leaning can be accomplished by moving the levers from "FULL RICH" to the idle cut-off position. A friction lock holds the lever in its selected position.

EMERGENCY FUEL CONTROL

51 Fuel shut-off to an engine is accomplished by turning off the appropriate engine tank selector and ensuring the "SUCTION CROSS FEED" control is off. (See Figure 1-21, Diagram of Cockpit Floor).

FUEL PRESSURE WARNING LIGHTS

52 The fuel pressure warning lights, located at the top of the main instrument panel, light to indicate insufficient fuel pressure for engine operation i.e. below 1-3/4 p.s.i.

53 The engine gauge unit is a multi-gauge indicating fuel pressure, oil temperature and oil pressure.

THROTTLE

54 The throttle levers, situated at the top centre of the control pedestal, are conventional in operation, i.e. forward for full throttle. A friction lock located between the throttle levers secures them in any selected position, and prevents them from creeping. (See Figure 1-7, Control Pedestal).

CARBURETTOR

55 The Expeditor 3 aircraft is fitted with a Stromberg float-type carburettor incorporating a butterfly-type throttle valve and a needle-type, variable-orifice mixture control. (See

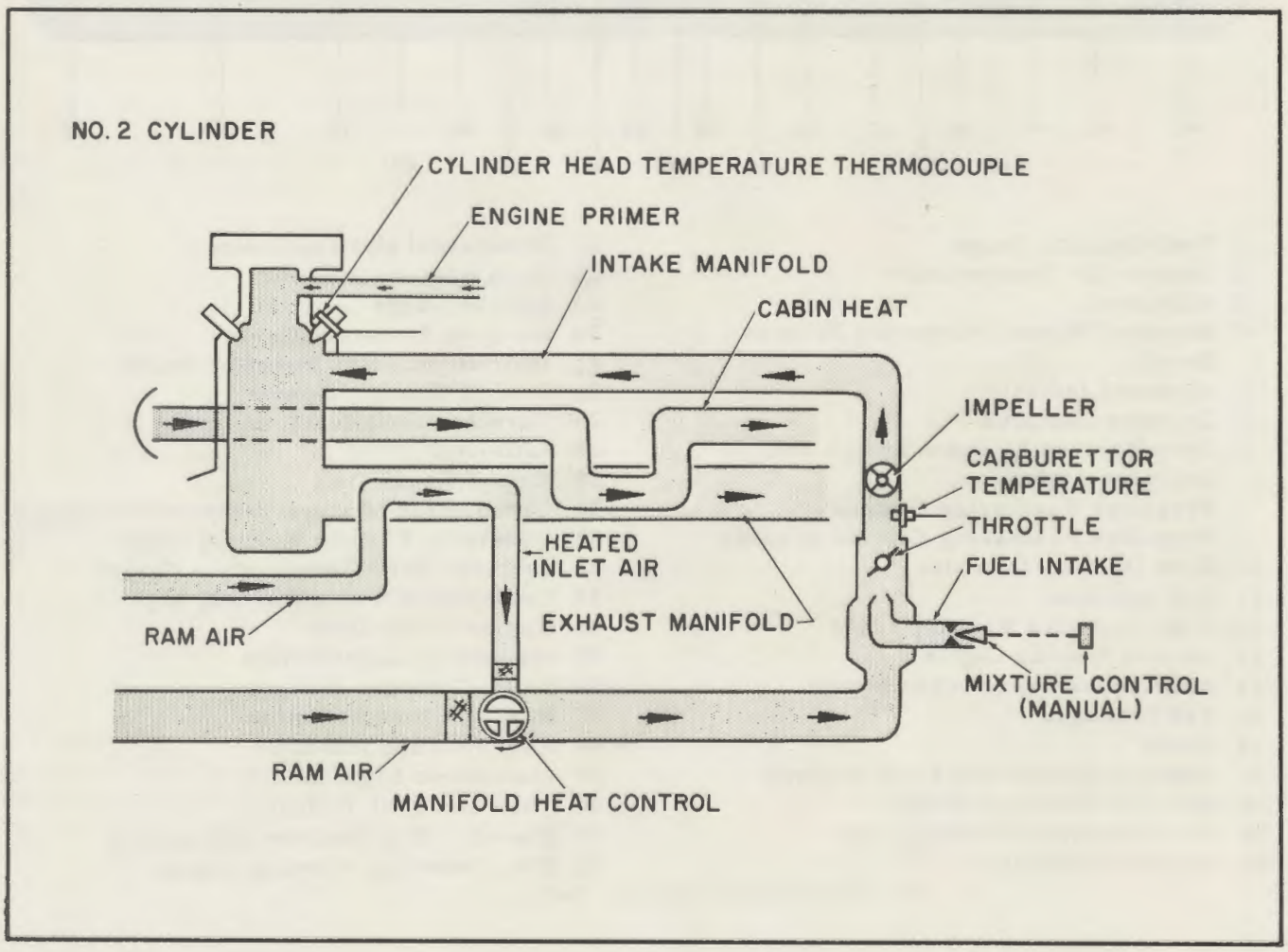


Figure 1-18 Air Induction System, Schematic Diagram

Figure 1-18, Schematic of Air Induction System). Inlet air to the carburettor is ducted to and passes through the carburettor heat valve, and a wire mesh screen. The manifold heat control, located on the left hand side of the pedestal actuates the carburettor heat valve between two limiting positions. (See Figure 1-7, Control Pedestal). With the control lever in the hot position, inlet air is ducted through a muff around the exhaust manifold (heat exchanger), and in the cold position, inlet air passes directly to the carburettor. Intermediate positioning of the control varies the mixture of hot and cold air and hence varies the carburettor air temperature. A friction lock for the mixture controls is located at their base, on the right side of the pedestal. The temperature of the mixture, indicated on the "CARB. MIX. TEMP" gauge on the main instrument panel is furnished by a temperature probe fitted in the carburettor between the throttle valve and the engine impeller. (See Figures 1-17 and 1-18).

PRIMER

56 An engine priming pump, operated manually by a handle on the pedestal, pumps raw fuel into the five uppermost cylinders of the engine selected. (See Figure 1-7).

IMPELLER

57 The impeller, located within the engine impeller casing, is driven by the engine crankshaft through reduction gearing. There are no impeller controls and therefore its speed is a function of the engine speed.

ENGINE COOLING

58 Engine cooling is accomplished by the adjustment of a set of cowl flaps on the underside of each power plant. Ram air is guided and accelerated around each cylinder head by sheet metal baffles. Two cowl flap handles located on the left hand side of the pedestal, control the escape of the ram air, and thereby adjust the cylinder head temperature. The upper handle is for the port engine and the lower one for the starboard engine. Each flap has four positions determined by notches in the control shaft. When the handle is pushed in the flaps are closed. To adjust the cowl flap opening the handle is turned 90 degrees and moved to the required setting. The cylinder head temperature thermocouple is located beneath the spark plug on No. 2 cylinder only. Corresponding readings are indicated on the "CYL TEMP" gauge on the main instrument panel (See Figure 1-17).

IGNITION SYSTEM

59 Both engines are equipped with dual magnetos and ignition systems. Four toggle switches, one for each magneto, are mounted on the right sub-panel. (See Figure 1-15, Co-pilot's Sub-panel). All switches have two positions: "on" and "OFF". Each switch functions independently of the others, but a hinged throw bar allows all four switches to be turned off in one motion.

STARTER

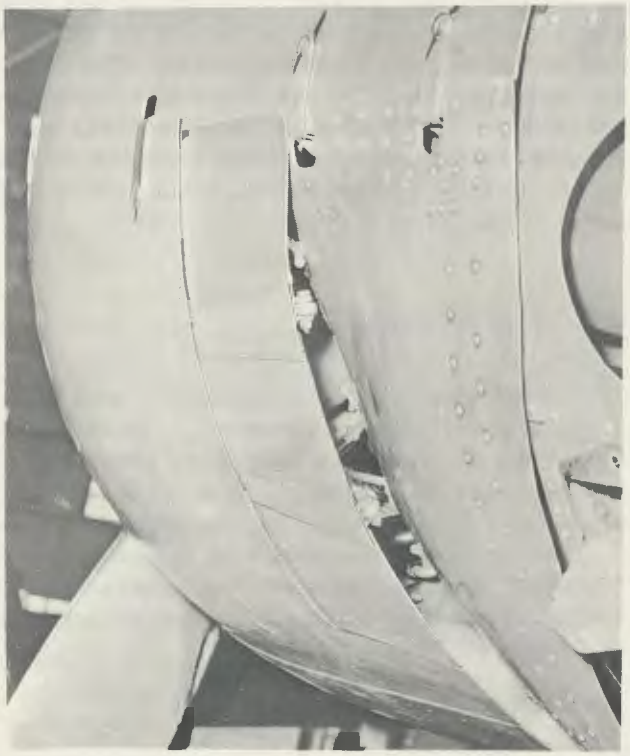
60 The engines are equipped with direct-engaging electric starters. A hot ignition spark for starting is provided by the ignition booster (induction vibrator).

61 Controls for the starters and ignition booster are located on the right sub-panel. They consist of a starter selector switch, a starter button and a booster button. The starter and booster buttons are both shielded by a single-hinged metal guard designed to prevent inadvertent operation. When starters are not in use, the selector switch should be in its central ("OFF") position.

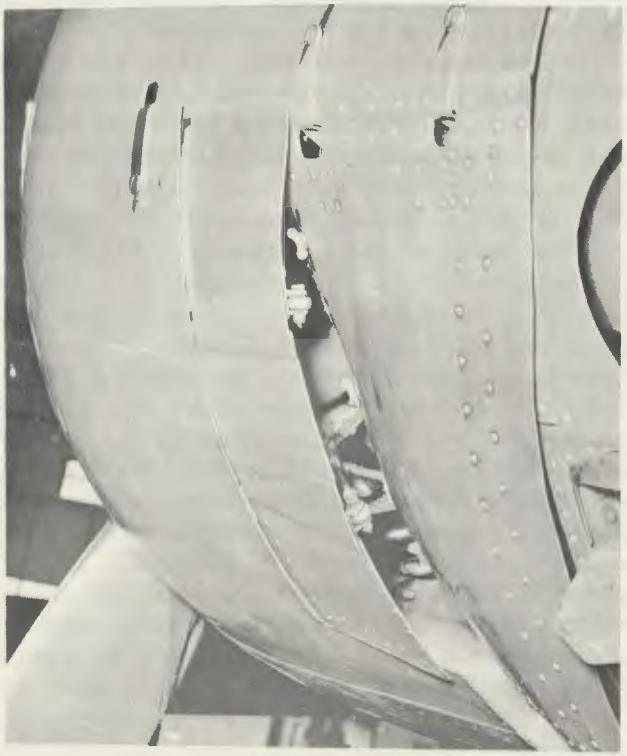
(a) The starter selector switch has three positions: "LEFT", "RIGHT", and a centre "off" position. This switch must be moved to either "LEFT" or "RIGHT" before the starter and booster, for the corresponding engine, will operate.

(b) The black "BOOSTER" button is the button to the left under the guard. When it is depressed, the ignition booster energizes the engine ignition system.

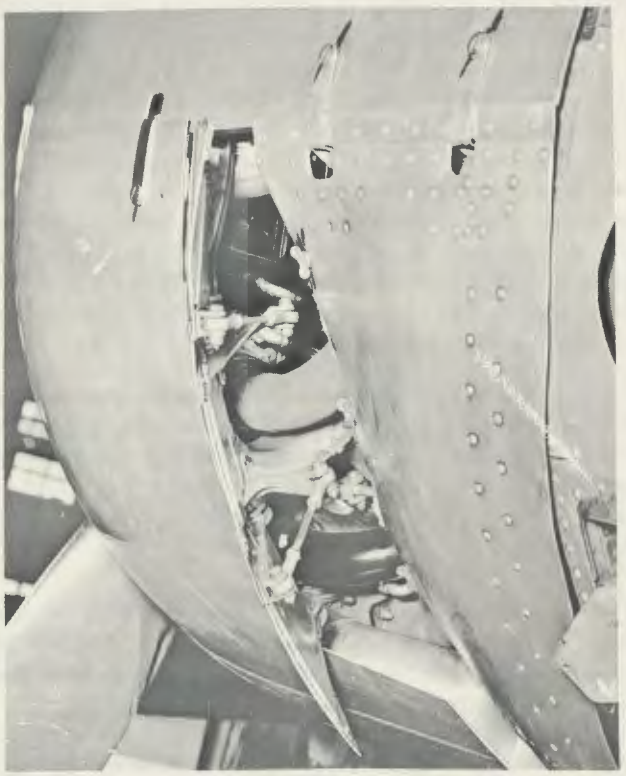
(c) The red "STARTER" button is the button to the right under the guard. When it is depressed, the starter motor engages and cranks the engine.



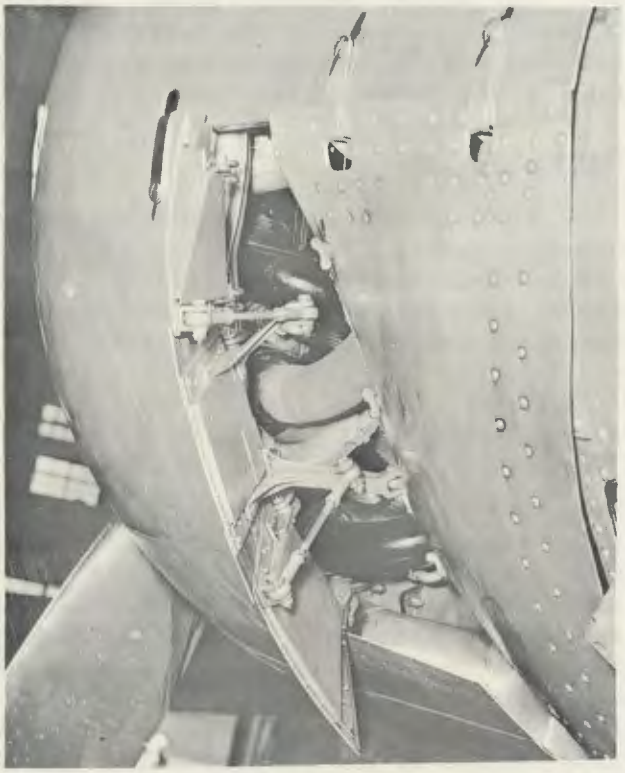
A. Closed



B. Trail



C. 2/3 Open



D. Fully Open

Figure 1-19 Cowl Flap Positions

PROPELLER

62 Each engine drives a two-bladed, Hamilton Standard hydromatic propeller, 99 inches in diameter. Engine speed is governed in the conventional manner, through variations of blade pitch. (See Part 1, paragraph 22). Engine oil pressure and the centrifugal twisting moment of the blades in one direction, and pressure created and controlled by an engine-driven governor in the other, varies the propeller pitch for constant speed conditions. (See Figure 1-5, Oil System Schematic Diagram). The two propeller levers on the control pedestal are mechanically linked to the propeller governors, and are used to select the desired pitch and, hence, engine speed. The levers vary the pitch from "fine" (fully forward) to "coarse" (fully aft). Either propeller can be fully feathered, using oil pressure supplied by an electric pump which is operated by push button controls mounted on top of the main instrument panel. (See Figure 1-17).

63 Oil dilution necessary for feathering during periods of low temperature is available automatically, providing the oil dilution switch has been moved previously to the "WINTER" position. (See Part 1, paragraph 21).

LANDING GEAR SYSTEM

64 The landing gear on all Expeditor 3 aircraft consists of two retractable main wheels and a retractable tail wheel. The main wheels are supported by oleo legs incorporating air-oil shock absorption. Lowering and raising the undercarriage is accomplished electrically. A motor transmits power through a clutch to a torsion-shaft. This, in turn, rotates a chain and slider mechanism which is connected to the undercarriage leg. The geometric design of the landing gear is such that up and down locks are not required.

65 The landing gear switch, identified by the miniature wheel forming its handle, has two positions: "UP" and "DOWN". To lower or raise the undercarriage - pull the landing gear switch outwards and then move it to the desired position. (See Figure 1-7, Control Pedestal).

66 The solenoid operated switch latch in the control pedestal engages and locks the landing gear position switch in the "DOWN" position, preventing accidental retraction while the weight of the aircraft is on the gear. As the right shock strut extends, it actuates the micro-switch opening the circuit to the solenoid, which in turn releases the latch.

LANDING GEAR WARNING SYSTEM

67 The landing gear warning system is operated by micro switches actuated by the right landing gear. When electrical energy is applied to the aircraft services (providing the landing-gear position-light contact breaker is reset) two lights on the control pedestal indicate the position of the undercarriage. When the undercarriage is locked down, in the safe landing position, the green light is illuminated and in the locked up position the red light is illuminated. During the period of retraction or extension of the undercarriage both lights will be out.

68 As a further precautionary measure, a warning horn sounds if the undercarriage is not locked down in the safe landing position when the throttles are retarded below a certain manifold pressure (set between 12 and 15 inches Hg).

69 The warning horn system can be disengaged, for a single retardation of the throttles only, by depressing the undercarriage horn silencer button on the main instrument panel. The warning horn system is again operative as soon as the throttle bank is advanced to a position above the limiting manifold pressure setting.

CAUTION

The landing gear must not be re-selected during either the up or the down cycle since heavy sparking occurs at the dynamic clutch relay contacts. This sparking has been known to ignite fumes underneath the cockpit floor.

BRAKE SYSTEM

MAIN WHEEL BRAKES

70 The aircraft is equipped with external single disc wheel brakes. The brakes are hydraulically operated by depressing the tips of the pilot's or co-pilot's rudder pedals. A shuttle valve mounted on each main wheel braking unit closes the fluid return line from each brake. The braking effect is in direct relation to the force applied to the rudder pedal.

PARKING BRAKES

71 The parking brake system utilizes the main wheel braking system. It maintains, mechanically, hydraulic pressure applied by normal brake operation. The parking brakes are applied by depressing the pilot's brake pedals and pulling out the parking brake handle while the toe pedals are still depressed.

NOTE

The handle must not be turned when applying the brake. Pressure to apply the brakes is supplied by the feet. Therefore the handle must be pulled gently to locate the valve and hence sustain brake pressure.

72 Applying the parking brake closes the parking brake valve, which is connected to the outlet line from the pilot's master brake cylinders. The T-handle parking brake control is located on the pedestal on the lower left side. (See Figure 1-7). The parking brake is released by depressing the pilot's rudder pedal tips and returning the brake handle to its original position.

HEATING SYSTEM

73 The heating system for all four configurations, 3N, 3NM, 3T and 3TM, comprises two separate symmetrical systems originating at the power plants. Each engine heats the air for use of its own side of the fuselage only. Ram air enters a duct, shielded by a mushroom shaped cover in the face of the power plant between the two outboard cylinders. (See Figure 1-18, Schematic of Air Induction System). The air passes through a seamless, stainless-steel intensifier tube within the engine exhaust tail-pipe, to a control valve beneath the leading edge. The ducting then divides; one duct going to the floor of the cockpit, the other to outlets in the cabin.

HOT AIR CONTROL

74 Two Push-Pull controls marked "PUSH HOT", mounted on the lower pedestal, in all four types of aircraft, adjust the overflow valve in each nacelle, thus controlling the quantity of hot air flowing to the cockpit, cabin and windshield, by a single action. (See Figure 1-7). In the "cold" position, hot air escapes to atmosphere, and in the "hot" position, hot air flows to the cockpit, the windshield, and the cabin. Intermediate positioning of the control varies the degree of heating. The control is operated by depressing the large button and sliding the plunger to the desired position.

COCKPIT HEATING (3T)

75 Air to heat the cockpit enters through a moulded louvre mounted on the floor outboard of the rudder control pedals. (See Figure 1-18). The louvre can be rotated to change the direction and quantity of the inlet air. A branch line from the inlet ducting beneath the floor supplies air to the cockpit windows for defrosting purposes (one system for each window).

CABIN HEATING (3T)

76 Heated air to the cabin passes through a non-adjustable air-scoop type outlet near the floor, at a mid-cabin location.

COCKPIT HEATING (3N and 3NM)

77 Heated air to the cockpit passes through a valve prior to entering the louvre on the cockpit floor. This valve interconnects two systems, cockpit heating and cockpit ventilating. Both systems, therefore, utilize the

same inlet louvre. A push-pull control located to the rear of the swivel-type inlet changes the supply from heated air to cold air, and has intermediate positions for mixing the air supply, and hence for varying the inlet temperature. (See Figure 1-21). When air is being supplied to the cockpit, a portion of that air will automatically flow over the windshield surface for de-frosting purposes, regardless of the inlet air temperature.

CABIN HEATING (3N and 3NM)

78 The cabin heating system is similar to that of the 3T aircraft except that an auxiliary duct from the left hand side inlet channels hot air to the astrodome for defrosting purposes. An "ON" - "OFF" cock mounted on the cabin inlet duct controls and varies the air supply to the astrodome. (See Figure 1-20).

CABIN HEATING (3TM)

79 The heating system is similar to the 3N and 3NM with one exception. As there is no astrodome there is no defrosting ducting. Running along each side of the cabin, level with the main hot air inlet, is a duct with three outlet louvres in it. The swivel-type louvres adjust the direction and quantity of the inlet air. Four controls, two on the pedestal and two on the cockpit floor, control the hot air supply by the same method as in aircraft types 3N and 3NM.

VENTILATING SYSTEM

80 Cold air is supplied to the fuselage through two separate symmetrical systems, one on the left side of the aircraft and one on the right.

CABIN SUPPLY (3N, 3NM and 3TM)

81 Fresh air enters a small duct through the inboard leading edge, and passes through a valve in the cockpit on the outboard side of each seat. The total air supply from each system to the cabin is adjusted at the valve by a push-pull control "up" (ON) "down" (OFF) mounted on the "step" portion of the main spar bulkhead. (See Figure 1-6). After passing through ducting above the cabin windows, the air enters the cabin through three swivel-type louvres. The louvres adjust the direction and quantity of inlet air for each passenger.

COCKPIT SUPPLY (3N, 3NM and 3TM)

82 Air to the cockpit enters a duct on the side of the fuselage and is fed into the cockpit through the valve which also regulates the heated air supply. (See paragraph 77 above).

COCKPIT SUPPLY (3T)

83 The air supply system for the cabin is similar to that in Expeditors 3N, 3NM and 3TM, except that the inlet valve control is mounted on the side of the cockpit, near the floor, outboard of the seat. The control is operated by a medium sized handwheel, which has indentations in its edge.

CABIN SUPPLY (3T)

84 There is no controllable ducted supply to the cockpit. Ventilation is obtained through the side windows.

EXHAUST

85 On all configurations of the Expeditor 3,

Figure 1-20 Astrodome De-frosting Control

air within the fuselage is exhausted through vents in the roof. Two are located in the cockpit and two are in the cabin. Rear-facing scoops on the outer skin tend to draw the air from the fuselage. Each vent can be adjusted by turning the swivel-type plate mounted over the outlet.

ANTI-ICING AND DE-ICING SYSTEMS

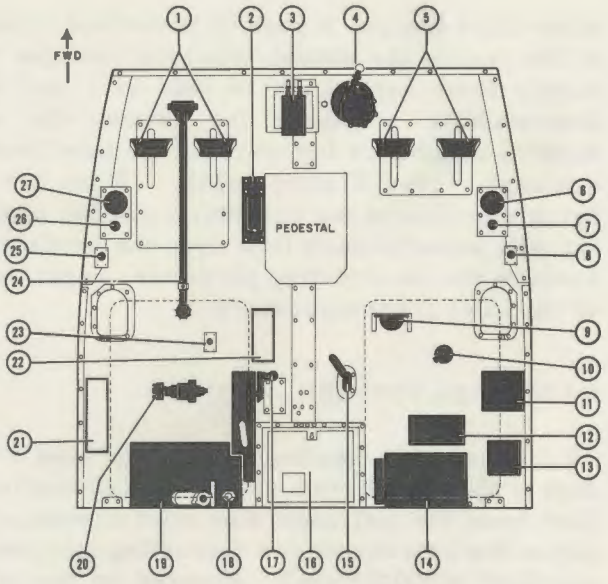
WING AND STABILIZER DE-ICING

86 De-icing boots are fitted to the leading edges of the wings and horizontal stabilizer. The pressure side of the engine-driven vacuum pumps supplies air pressure to operate the system. A rotating, electrically-driven distribution valve controls inflation and deflation of the boot sections. A line from the suction side of the vacuum system, connected to the distribution valve, holds the boot against the leading edge when the system is not in use, and helps to hasten deflation during that cycle of operation. The de-icing system is controlled by a two-position ("fully out" and "fully in") push-pull type control located on the co-pilot's sub-panel. (See Figure 1-15). A de-icing pressure gauge is located in the lower right hand corner of the main instrument panel. (See Figure 1-17). The normal de-icer operating pressure is between 7 and 8 psi. However, between complete cycles of operation the pressure will drop to approximately 2 psi.

87 The lower portion of the vertical stabilizers are neoprene covered and no de-icing liquid or mechanism is required for de-icing at this location.

PROPELLER ANTI-ICER

88 An anti-icing slinger ring is attached to each propeller hub. Anti-icing fluid is forced to the slinger rings from the tank behind the pilot's seat, by an electric pump located beneath the seat. The speed of this pump (and thus the rate of flow of anti-icer fluid), is controlled by a rheostat, located on the co-pilot's sub-panel. (See Figure 1-15). The controlling rheostat operates in a clockwise direction. Moving it from the "OFF" position, the control passes to the "MAX" position at



1 Pilot's Rudder Pedals
2 Landing Gear Clutch
3 Fire Detection Relay
4 Engine Fire Extinguisher CO_2 Bottle
5 Co-pilot's Rudder Pedals
6 Co-pilot's Hot and Cold Air Inlet
7 Co-pilot's Cabin Air Temperature Control
8 Generator Circuit Breaker, Right Engine (3N, 3NM, 3TM)
9 Undercarriage Warning Horn
10 Cross-Feed Valve
11 Gyrosyn Amplifier
12 Servo Amplifier (3N, 3NM)
13 Gyrosyn Power Unit
14 ILS Glide Path Receiver
15 Wobble Pump Handle
16 Landing Gear and Wing Flap Motor Access Door
17 Landing Gear and Wing Flap Hand Crank
18 Anti-Icer Fluid Tank Gauge
19 Anti-Icer Fluid Tank
20 Anti-Icer Fluid Pump
21 Map and Data Case
22 Signal Cartridge Stowage
23 Landing Gear Circuit Breaker
24 Flight Control Lock
25 Generator Circuit Breaker, Left Engine (3N, 3NM, 3TM)
26 Pilot's Cabin Air Temperature Control
27 Pilot's Hot and Cold Air Inlet

Figure 1-21 Diagram of Cockpit Floor

which point the pump is operating at its maximum rate. Turning it further to the right, gradually reduces the rate of supply of fluid to the propeller slinger ring. When the pump is operating at maximum speed, (MAX), the total output to the propellers is 9 or more Imp quarts per hour. This output may be as high as 20 Imp quarts per hour giving a duration of 30 minutes. When the rheostat is set at "NORMAL" and the anti-icer system is adjusted correctly, the total output is 6 to 7.2 Imp quarts per hour giving a duration of supply between 1 hour 23 minutes and 1 hour 40 minutes. The anti-icing tank is situated behind the pilot's seat. It has a capacity of 2.5 Imp gal (3 US) and is equipped with a quantity gauge mounted on top. Anti-icing fluid used is RCAF Specification 3-GP-525 (Isopropyl alcohol).

CAUTION

To protect the anti-icer pump from stalling, do not operate the controlling rheostat beyond the lower limit, indicated by the word "NORMAL" on the instrument panel.

PITOT HEAD ANTI-ICER

89 Both right and left pitot tubes are equipped with electric pitot heaters. An "on-off" switch for the heaters is located on the pilot's sub-panel on all models. (See Figure 1-12).

WINDSHIELD AND ASTRODOME DEFROSTERS

90 The heater air supply for cockpit heating is utilized to defrost both windshields and the astrodome. For details of the controls for each configuration see Part 1, paragraphs 75 and 77.

CARBURETTOR ANTI-ICING

91 Icing of the carburettor is prevented by preheating the intake air. For details of the associated engine controls see Part 1, paragraph 55.

FLIGHT AND ENGINE INSTRUMENTS

92 The carburettor mixture temperature gauge, oil temperature gauge, flap indicator, elevator tab indicator, fuel level gauge and outside air temperature gauge operate on direct-current electrical power. The tachometers and cylinder head temperature gauges are self-generating electrical instruments which do not require power from the aircraft's electrical system.

93 The manifold pressure gauge, located on the main instrument panel, measures the fuel mixture pressure in the induction manifold. The gauge is operated by pressure supply lines from the engine, and has two concentric pointers marked "L" and "R" which indicate the pressure in inches of mercury within each engine.

94 A free air temperature gauge, independently controlled, is fitted in the cockpit ceiling above the pilot. Because it indicates accurately the outside air temperature, it is used to detect temperatures in the critical icing range. The gyro instruments on the pilot's panel, the turn and bank indicator, gyro horizon indicator, and gyrosyn compass, are of the electrical type. The turn-and-bank indicator operates on direct current, while the gyro horizon indicator operates on alternating current supplied by the aircraft's inverter. The C2 gyrosyn compass (directional indicator) uses both alternating and direct current. Failure of the inverter renders the gyrosyn compass and the gyro horizon indicator inoperative; there is no emergency source of alternating current. The gyro instruments on the co-pilot's panel are vacuum operated. Since the aircraft is equipped with twin sources of static pressure, an alternate source is unnecessary. Static pressure openings are located on either side of the fuselage about four feet forward of the horizontal stabilizer. Instruments operated by static pressure include the altimeter, ASI and rate of climb for both pilot and co-pilot. The co-pilot's artificial horizon and directional indicator have individual controls adjacent to the instrument, for caging and uncaging the gyro. (See Figure 1-17 Main Instrument Panel).

95 The aircraft is fitted with a Sperry H-5 gyro horizon indicator. The controls associated with this installation consist of an inver-

ter power switch on the right sub-panel and an additional switch and warning light mounted above the gyro horizon indicator. When the inverter power switch is selected "ON", a quick-erection device is also engaged. After approximately 20 seconds a thermal relay opens and breaks the circuit to the quick-erection device. The only time this quick-erection feature is effective is immediately after the inverter is switched "ON"; it cannot be used to erect a toppled gyro in flight without turning the inverter switch off, and allowing time for the thermal relay to cool. The warning light remains on while the quick-erection circuit is closed. If this light stays on for more than 30 seconds, indicating malfunction of the thermal relay, the switch adjacent to the instrument must be moved to the "OFF" position. In this position the switch replaces the thermal relay in opening the quick-erection circuit and thus prevents damage to the quick-erection coil and the gyro windings. Normally, this switch should be left on, but selecting the switch to "OFF" does not adversely affect the functioning of the gyro horizon indicator once the initial quick-erection cycle is completed.

INTERIOR LIGHTING EQUIPMENT

GENERAL

96 **The master battery switch must be turned on before any lights can be operated by their individual switches unless either external power is being used or the generators are operating.**

INSTRUMENT PANEL LIGHTS

97 There are three fluorescent instrument lights; one on the left control column, which is adjusted by a rheostat in front of the pilot; one on the right control column, which is adjusted by a rheostat in front of the co-pilot; and one overhead, just forward of the radio control panel, which is adjusted by a rheostat forward of the propeller levers. All rheostats are on the instrument panel and additional control of illumination is provided by a shutter arrangement on each light. The lights are operated by turning the rheostat knob to the start position momentarily and then adjusting the illumination to required value. To supplement fluorescent lighting the B16 compass is illuminated by a miniature bulb controlled by a rheostat on the pilot's sub-panel. Three spare miniature bulbs for the compass are stored in threaded holes in the right sub-panel. The radio controls are illuminated by an amber spotlight recessed in the lower forward side of the main spar bulkhead. This light is controlled by a rheostat adjacent to its left but operates only when the navigation lights are on.

MAP LIGHTS

98 **Two red lights, for night map reading, are fitted one on either side above the side windows in the cockpit. A switch is mounted on the light base. A reel-type extension light with a six-foot extension cord is fitted to all aircraft. (See Figure 1-30). In 3T and 3TM types, the lamp is stowed on the underside of the co-pilot's seat. In 3N and 3NM type aircraft, the lamp is stowed under the forward edge of the front navigation table. An on-off switch is mounted on each cord stowage box. The reel is spring-loaded to recoil the cable automatically.**

CABIN LIGHTS

99 **The cabin is illuminated by two dome lights controlled by the "CABIN - DOME LIGHT" switch on the co-pilot's sub-panel. 3T type aircraft have additional individual switches on the dome light fixtures.**

100 **Each navigation table (3N and 3NM) is equipped with an angle-poise lamp. The controlling rheostat for the forward lamp is mounted on the navigator's instrument panel, and the control for the rear lamp is mounted on the base. (See Figure 1-1).**

101 **3TM type aircraft have fixed independent reading lamps fitted to the upper air duct above each of the five seats. Reading lamps on the 3T are the swivel type and are mounted on the upper air duct above the three right hand side seats only. On-off switches for the reading lamps are fitted to each lamp mounting plate.**

BAGGAGE COMPARTMENT LIGHTS

102 Both baggage compartments are adequately illuminated by individual lights. An on-off switch is provided on each installation. The rear compartment light also illuminates the toilet and the radio equipment.

EXTERIOR LIGHTING EQUIPMENT

NAVIGATION LIGHTS

103 The aircraft is equipped with flashing navigation lights controlled by a switch on the pilot's sub-panel. The system consists of a red (left) and green (right) wing tip light, a red and white twin tail light installation and an upper and lower white fuselage light. The wing tip lights have plexiglas reflectors attached to them which make them visible from the cockpit. The control has three positions: "FLASHING" (up), "STEADY" (down) and "OFF" (centre). When the switch is in the "FLASHING" position, the red and green wing tip lights and white tail light alternate with the red tail light and the upper and lower fuselage lights. When the switch is in the "STEADY" position, the red, green wing tip lights and white lights burn continuously. If the flasher control unit fails, these three lights will remain on.

LANDING LIGHTS

104 Two switches mounted on the pilot's sub-panel control the landing lights. The switches have three positions: "EXTEND", "OFF", and "RETRACT". The lights turn on automatically when they extend and off automatically when they retract. When the switch is positioned in "OFF", energy to both the light and actuating motor is cut off. The switch should be placed in "OFF" whenever lights are not in use.

COCKPIT EQUIPMENT

PILOT'S AND CO-PILOT'S SEATS

105 Both seats are adjusted by turning a small crank located below the forward edge on each seat. (See Figure 1-16). The seat moves forward and up, or aft and down, when the crank is turned. The seats are equipped with conventional waist and shoulder safety straps. When in use the loops on the shoulder straps pass through the catch on the right hand waist strap. The shoulder straps are secured to the main spar bulkhead by means on an inertia reel. This reel keeps the straps taut, and at the same time does not restrict body movement, unless the inertia reel locks are applied.

INERTIA REEL LOCKS

106 Inertia reel locks for locking the shoulder harness inertia reels are mounted on the outboard side of both pilot's and co-pilot's seats. The inertia reels allow both pilot and co-pilot to lean forward (to operate controls, visually check wheels, etc) without unfastening their shoulder harnesses. Inertia reels should be locked during take-off and landing. The inertia reels are locked by depressing the button on top of the lever, and then moving the lever forward.

WINDOWS

107 Windows on both sides of the cockpit can be opened on the ground or during flight, for ventilation. The small clear vision panel to the rear of the curved windshield on the pilot's side may also be opened if forward visibility is obstructed by ice on the windshield. The window is secured by two rotating latches in the closed position and by a knurled nut and stud on the cockpit roof in the open position. Side windows are of the sliding type. On 3N, 3NM aircraft they are secured at various positions by a latch at their base.

EMERGENCY EQUIPMENT

HAND FIRE EXTINGUISHERS

108 The aircraft is equipped with two liquid type hand fire extinguishers. (See Figure 1-22 and 1-23). In 3N, 3NM and 3TM aircraft, one extinguisher is stowed on the forward face of the rear cabin bulkhead, in front of the cabin door, whilst the other is stowed on the main spar bulkhead on the right hand side of the entrance to the cockpit. On 3T aircraft the forward extinguisher is stowed horizontally

Figure 1-22 Hand Fire Extinguisher (Main Spar Bulkhead)

beneath the co-pilot's seat, and the rear extinguisher on the rear cabin bulkhead.

ENGINE FIRE EXTINGUISHER SYSTEM

109 A pressure-type, one-shot, carbon dioxide, engine fire extinguisher system is operated by the two controls mounted near the deck on the control pedestal. (See Figure 1-7). The selector valve has three positions: "LEFT ENGINE", "OFF", and "RIGHT ENGINE". The other control is a discharge handle which is connected to the valve on the carbon dioxide bottle by a cable. The carbon dioxide bottle is located forward of the control pedestal. Pulling the discharge handle straight back allows carbon dioxide to flood the engine compartment to which the selector valve is set.

FIRE DETECTION LIGHTS

110 Two red fire detection lights, one for each engine, are mounted on the main instrument panel below the pilot's altimeter. (See Figure 1-17). The lights are designed to flash on whenever any one of the detector units, either on the firewall or in the nacelle, is subjected to an abnormally rapid increase in temperature. The warning light goes out when the fire is extinguished but will relight in cases of re-ignition. No resetting is necessary. A switch for testing the completeness of the fire warning circuit is located on the pilot's sub-panel.

ENGINE FIRE EXTINGUISHER DISCHARGE INDICATOR

111 A discharge indicator is fitted to the skin of the aircraft between the two pitot tubes. The red indicator disc is ejected when the pressure in the system is abnormally high this red indicator disc is not displaced on normal discharge of the extinguisher.

Figure 1-23 Hand Fire Extinguisher (Rear Cabin Bulkhead)

SIGNAL PISTOL

112 A signal pistol is stowed in a holster attached to the back of the co-pilot's seat. (See Figure 1-24). A firing tube, which rigidly houses the pistol when it is fired, is situated immediately above the co-pilot's seat. The catch on top of the pistol releases it from the tube after use. A cover which seals the firing tube when not in use is held in place by spring clips. On the 3N, 3NM and 3TM, the signal cartridges are stowed in a tray on the cockpit floor on the inboard side of the pilot's seat. On the 3T, the signal cartridges are stowed in a box with pigeon holes, mounted on the rear right hand side of the main spar bulkhead. A flare chute in the floor of the cabin of 3N and 3NM aircraft can be used for releasing smoke bombs, flares and other pyrotechnic equipment. The chute is covered by a hinged metal plate when not in use. Smoke bombs may be stowed in a rack on the left side of the cabin.

CRASH AXE

113 The crash axe is mounted on the rear face of the main spar bulkhead in a leather holster. (See Figure 1-25).

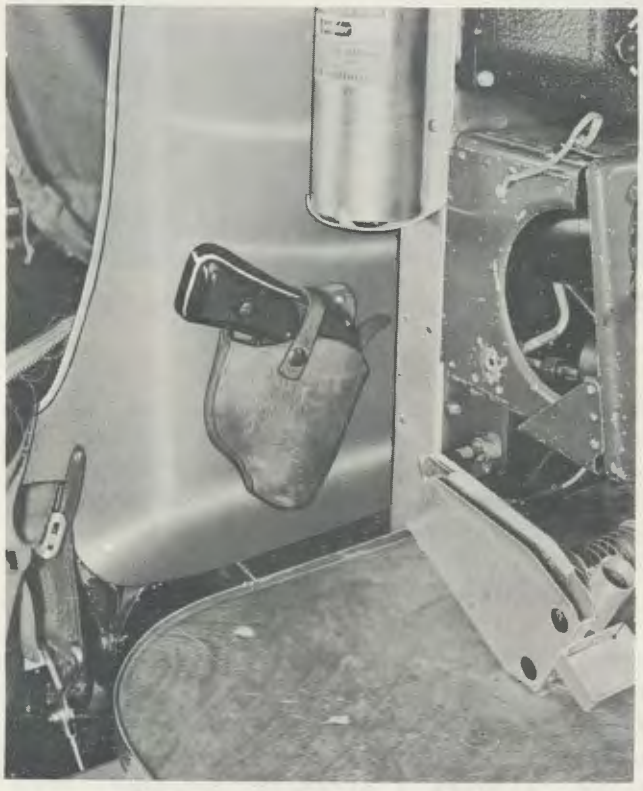


Figure 1-24 Signal Pistol Stowage

Figure 1-25 Crash Axe Stowage

EMERGENCY EXIT

114 In an emergency, escape can be made from aircraft by opening the emergency exit located on the right cabin wall. The exit is designed primarily for escape when the cabin door is blocked, and should not be opened except in emergency. Instructions for opening the hatch appear on each exit. (See Figure 1-26).

MAIN DOOR HINGE EMERGENCY RELEASE

115 The cabin door is provided with a mechanism for releasing the hinge pins so that the door may be jettisoned in emergency. (See Figure 1-27). The release handle is at the forward edge of the door beneath a red metal flap on the cabin wall.

ASTRODOME EMERGENCY RELEASE

116 The astrodome on 3N and 3NM aircraft

Figure 1-26 Emergency Exit Ejection Mechanism

serves as an extra emergency exit and can be removed by pulling the "T" shaped handle secured to its forward edge. (See Figure 1-28). Vigorous movement of the astrodome breaks the bonding strip and the dome can be pulled downward.

FIRST AID KIT

117 A sealed first aid kit is mounted on the rear of the lavatory compartment door in all aircraft.

Figure 1-27 Cabin Door Hinge Emergency Release

EMERGENCY MAPS AND FORCED LANDING INSTRUCTIONS (OR CRASH INSTRUCTIONS)

118 All aircraft are equipped with emergency maps and a set of forced landing instructions. These items are stowed either in the pilot's map case (outboard of seat) or taped to a cabin window or the cabin wall, or in a canvas bag mounted on the rear cabin bulkhead.

PARACHUTES

119 Normally there is provision for the stowage of three parachutes on Expeditors 3N, 3NM and 3T. Two may be stowed on the left

Figure 1-28 Astrodome Emergency Release Handle

hand side of the cabin and the third may be secured to the back of the rear seat. The stowage consists of a clamped bungee cord. No provision is made for the stowage of parachute packs on 3TM aircraft.

NAVIGATION EQUIPMENT

120 There are two positions for navigation students in the Expeditor 3N and 3NM. (See Figures 1-29 and 1-30). The forward navigator's position has a free air temperature gauge, a Mark 1 airspeed indicator, CL2 gyrosyn compass, altimeter, Mark 1 air pos-

ition indicator and a Mark 1 air mileage unit. The rear navigator's position has an AN/ARN -7 radio compass, a 182A azimuth indicator and a V-3 gyrosyn repeater.

121 In addition to the cabin instruments, the rear navigator's position is equipped with a B-3 driftmeter mounted directly to the right of the chair and a B-5 drift recorder, mounted on the right sidewall behind the navigator's chair. (See Figure 1-31). A Mark 9A sextant and case and an astrocompass may be stowed on the shelf supporting the B-3 driftmeter adjacent to the rear navigator's chair. Both forward and rear navigator's positions are provided with tables.

ASTRODOME

122 Navigational trainers incorporate a plastic astrodome in the forward cabin roof. A bracket, attached to the crown of the dome, contains a fitting that accomodates the astrocompass and the sextant when they are in use.

Figure 1-29 Forward Navigator's Position

Figure 1-30 Rear Navigator's Position

COMMUNICATIONS EQUIPMENT

GENERAL DESCRIPTION

123 The aircraft has one 190-550 kilocycle range receiver, one 3 to 6 megacycle high frequency receiver, one 6 to 9 megacycle high frequency transmitters (one 3 to 4 megacycle the other 5.3 to 7 megacycles), a radio compass receiver and indicators, a ten-channel very high frequency transceiver, a marker-beacon receiver, localizer and glide path receivers and indicator, an interphone system and an isolation amplifier system. Radio controls are located on a master control panel mounted overhead in the pilot's compartment. (See Figure 1-32). The electronic units are mounted on racks at the rear of the lavatory compartment. (See Figures 1-33 and 1-34). All antennae are external. Reception can be heard either through headphones or from speakers mounted behind the pilot's and co-pilot's seats. Spare miniature bulbs for instrument illumination are inserted into threaded holes in the panel.

COMMAND INSTALLATION

124 The equipment used in the Command installation (SCR-274N) consists of a range

receiver (BC-453B), MHF receiver (BC-454B), HF receiver (BC-455B), HF transmitter (BC-696A) and a modulator (BC-456B). In some 3N, 3NM and 3TM aircraft an HF transmitter (BC-457A) is used in lieu of the HF transmitter (BC-696A). The (SCR-274N) installation provides an aural L.F. range signal for pilot and navigators and MHF communications between the aircraft and ground stations, operated by either the pilot or co-pilot. Under ideal conditions the range of the receivers is between 100 and 200 miles, and the transmission range is between 50 and 100 miles.

125 Each receiver has a three-position function switch "CW", "OFF" and "MCW", as well as a crankhandle tuner and a volume control. (See Figure 1-32). MCW is selected for Command purposes, and CW for navigational purposes and for increasing the range.

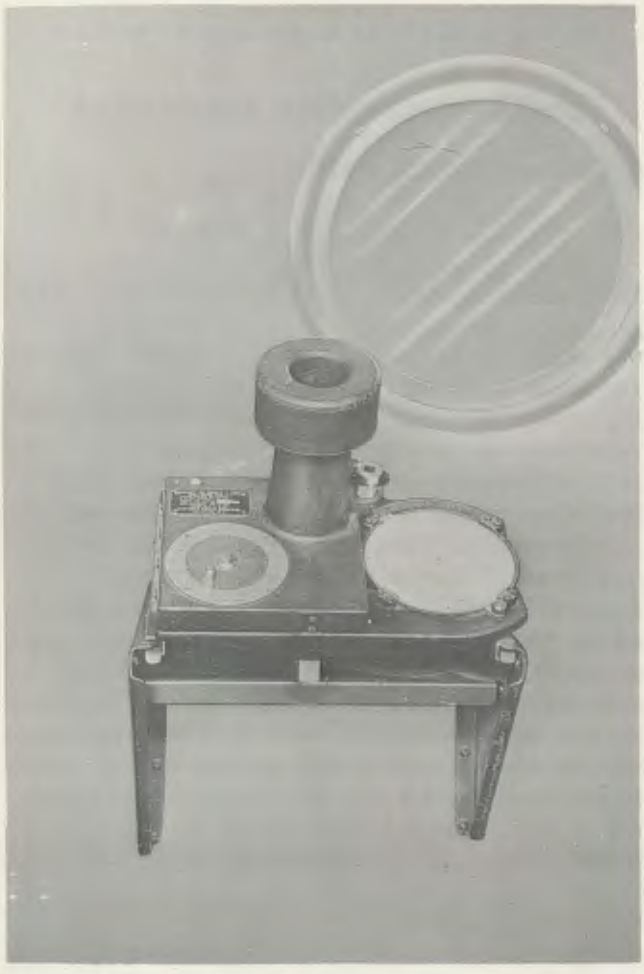


Figure 1-31 B-5 Drift Recorder

Figure 1-32 Master Radio Control Panel

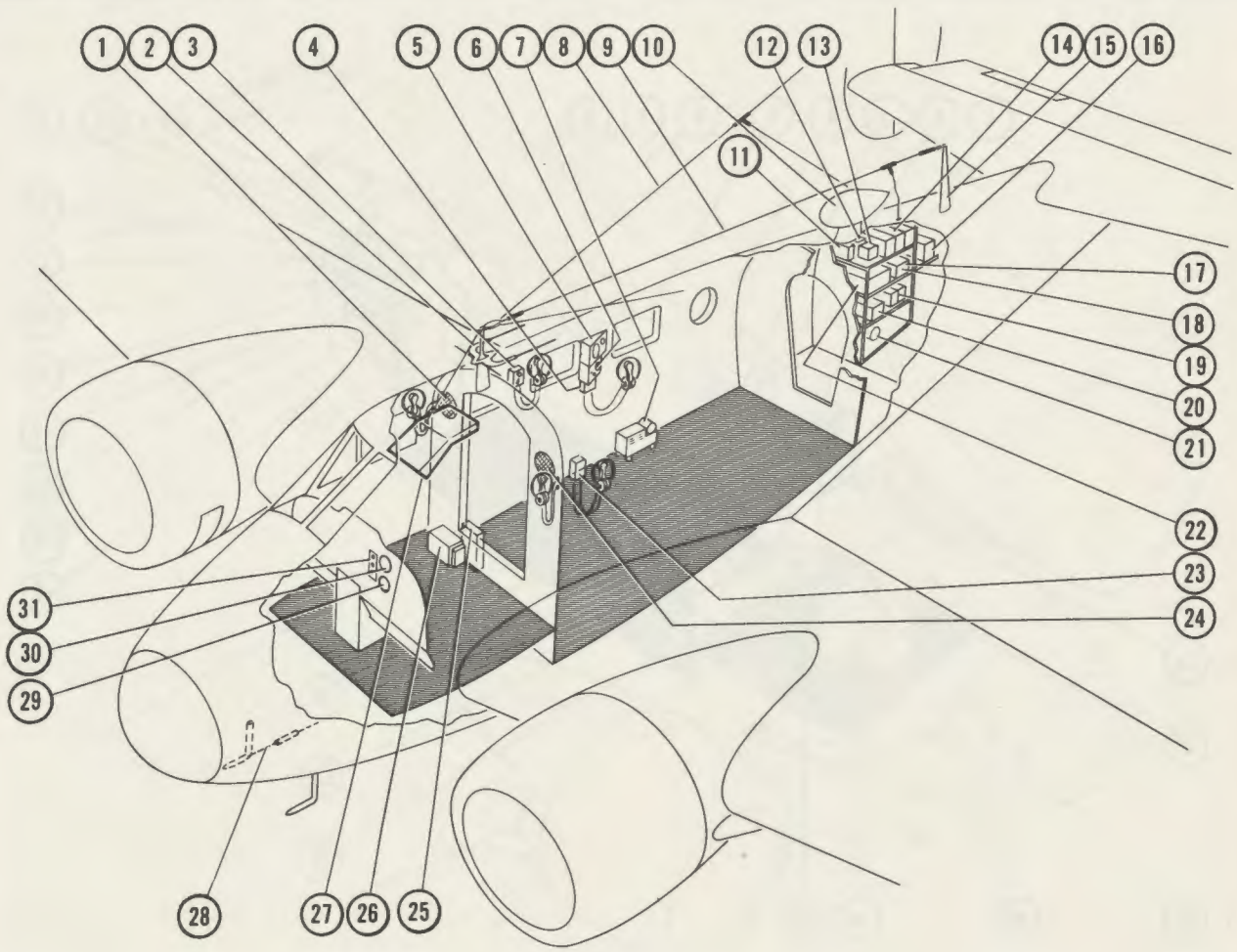
function switch: "TONE", "CW" and "VOICE", and a transmitter selector "1" "2" "3" "4" (see channel allocation card on panel for preset frequencies). The function switch is set to "VOICE" for normal transmission and "CW" or "TONE" for signalling by key. Since no key is fitted, the microphone control button can be used as a substitute. Selection of "CW" enables non-modulated signalling which is normally used in preference to "TONE" i.e. Modulated signalling. Greater output and range may be obtained in the "CW" position.

RADIO COMPASS (AN/ARN-7)

127 The radio compass is used for manually controlled or automatic radio direction finding. Automatic D.F. is accomplished by a nul-seeking, closed-servo system, when the function switch is in the "COMPASS" position. It receives signals on the range and broadcast bands - both of which are divided into two ranges on the dial. The radio compass is operated by the pilot on all Expeditor versions, and also by the rear navigator on 3N and 3NM type aircraft. The equipment can receive over a range of up to approximately 100 miles.

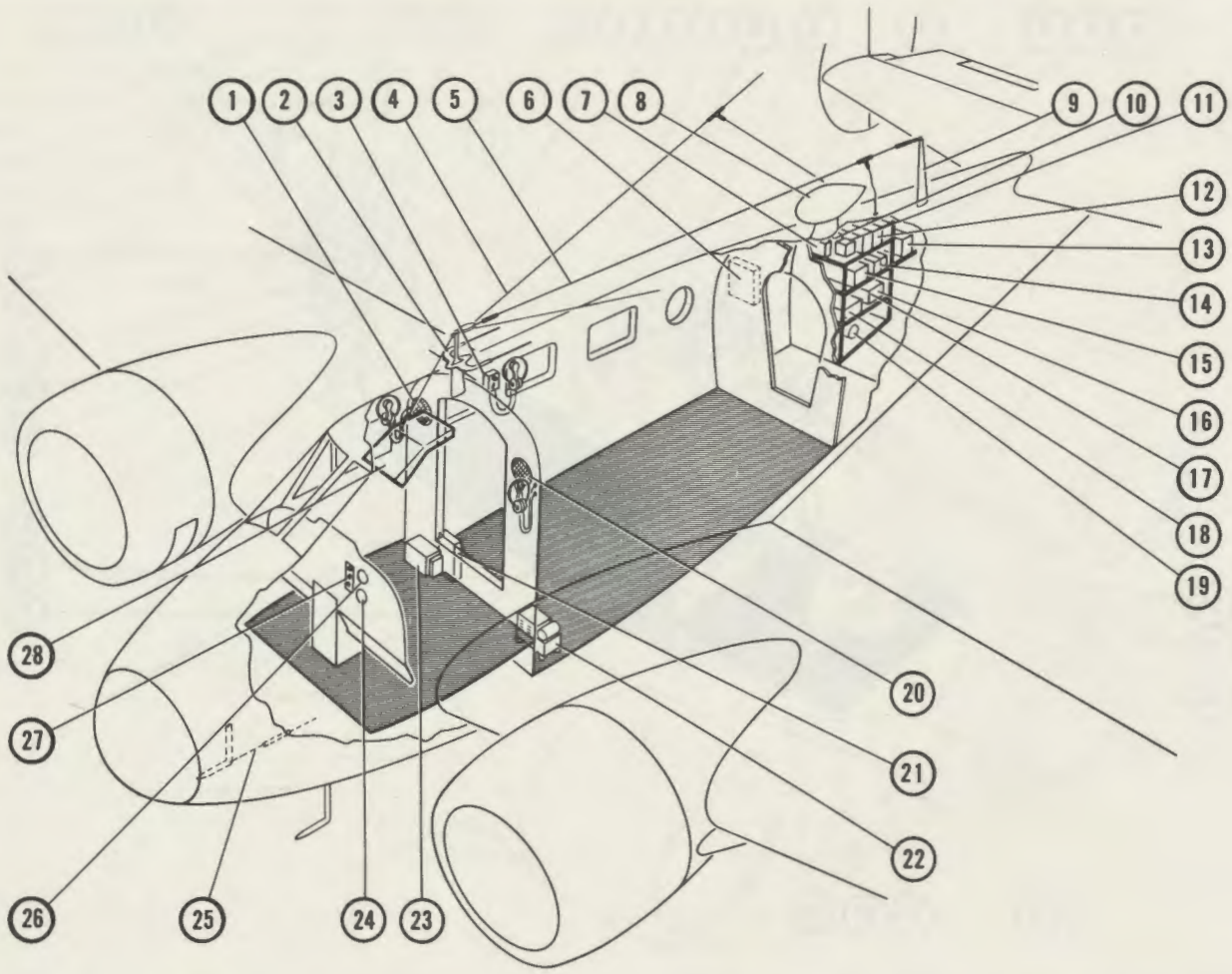
RADIO COMPASS TRANSFER BUTTON

128 Depressing the compass transfer button alternates the control between the pilot and navigator and can be used for both taking and giving control.



1 Co-pilot's Speaker
2 Localizer and Glide Path Receivers Di-pole Antenna
3 First Navigator's Jack Box (3N, 3NM)
4 Second Navigator's Jack Box (3N, 3NM)
5 Radio Compass Indicator
6 Radio Compass Control Panel
7 Localizer Receiver BC 733
8 SCR 274 Antenna
9 Radio Compass Sense Antenna
10 Radio Compass Loop Antenna
11 No. 10 Bulkhead Junction Box
12 Interphone Amplifier
13 Antenna Relay
14 Receivers BC 453B, BC 454B, BC 455B Part of SCR 274 installation (Items 14, 17 and 19)
15 AF/ICA-67 VHF Antenna
16 Marker Receiver MN 53B
17 Modulator BC 456, Part of SCR 274 Installation (Items 14, 17 and 19)
18 Iso-Amplifier (Outboard of Modulator)
19 Transmitters BC 458A, and BC 696A or BC 457A. Part of SCR 274 Installation (Items 14, 17 and 19)
20 VHF Transceiver AF/ICA-67
21 Radio Compass Inverter
22 Radio Compass Receiver
23 Navigation Instructor's Jack Box
24 Pilot's Speaker
25 No. 5 Bulkhead Junction Box
26 Glide Path Receiver R89B
27 Master Radio Control Panel
28 Marker and Range Antenna
29 Radio Compass Indicator
30 Localizer and Cross Pointer Indicator
31 Marker Indicator Lights

Figure 1-33 Radio Equipment Location Diagram (3N, 3NM and 3TM).



1 Co-pilot's Speaker
2 Localizer and Glide Path Di-pole Antenna
3 Forward Cabin Junction Box
4 SCR 274 Antenna
5 Radio Compass Sense Antenna
6 No. 9 Bulkhead Junction Box
7 No. 10 Bulkhead Junction Box
8 Radio Compass Loop Antenna
9 AF/ICA-67 VHF Antenna
10 Interphone Amplifier
11 Antenna Relay
12 Receivers BC 453B, BC 454B, BC 455B Part of SCR-274 Installation (Items 12, 14 and 16)
13 Marker Receiver MN-53B
14 Transmitters, BC 458A and BC 696A or BC 457A. Part of SCR 274 Installation (Items 12, 14 and 16)
15 VHF Transceiver AF/ICA-67
16 Modulator BC 456. Part of SCR 274 Installation (Items 12, 14 and 16)
17 Iso-Amplifier (Outboard of Modulator)
18 Radio Compass Receiver
19 Radio Compass Inverter
20 Pilot's Speaker
21 No. 5 Bulkhead Junction Box
22 Localizer Receiver BC 733
23 Glide Path Receiver R89-B
24 Radio Compass Indicator
25 Marker and Range Antenna
26 Localizer and Glide Path Cross Pointer Indicator
27 Marker Indicator Lights
28 Master Radio Control Panel

Figure 1-34 Radio Equipment Location Diagram (3T)

COMPASS FUNCTION SWITCH

129 The function switch has four positions: "OFF" "COMP" "ANT" "LOOP". A green indicator to the left of the switch indicates that the compass is on. If it is not illuminated, depress the transfer switch.

TUNING DIAL

130 The dial is calibrated in kilocycles. A selector switch selects one of the four available sectors and at the same time blanks off the other three. Tuning is accomplished by a crank on the lower left hand corner of the panel.

COMPASS TUNING METER

131 With the function switch on "COMP" station resonance may be obtained by adjusting the tuning crank until the tuning meter indicates a maximum deflection.

COMPASS "CW" AND "VOICE" SWITCH

132 Either selection may be made, depending on the type of the transmitting source. Selection of "CW" also increases the range of the equipment to receive distant stations. The light rheostat controls illumination of the two compass instruments, the tuning meter and the range dial. Receiver volume is adjusted by the "AUDIO" gain control.

LOOP "L - R" CONTROL

133 With the function switch in the "LOOP" position, the antenna may be rotated manually to obtain the null position. Rotation is governed by the "LOOP" left-right control. Two nulls will be received in 360°. Depressing this control and selecting the desired direction drives the loop at a greater speed.

NOTE

For manual operation refer to flight procedures. A low frequency audio note will be heard when the compass is taking ADF bearings. This noise does not occur in the "ANT" or "LOOP" modes of operation.

VHF TRANSCEIVER (AF/ICA-67)

134 The transceiver can be operated by the pilot or co-pilot, transmission and reception being limited to the line of sight. The unit is remotely controlled by a rotary channel selector switch and a volume control. Transmission and reception on the same frequency is provided on any of ten preset channels, chosen by the channel selector switch. (Refer to the channel allocation card on the panel for applicable frequencies). Transmitting and receiving is controlled through a multi-position selector switch. The positions are marked "A" to "J" inclusive together with an "OFF" position. A volume control is mounted to the left of the selector.

MARKER BEACON RECEIVER (BENDIX MN-53B)

135 The function of the marker beacon system is to detect either the cone (Z) beacons on the airways, fan markers or the landing field approach beacons. The system may be controlled by either the pilot or the co-pilot. Reception is possible to the service ceiling of the aircraft.

136 The marker-beacon receiver is preset to receive a 75 megacycle modulated signal. Power to the receiver is controlled by a selector switch in the centre of the switch bank, marked "OFF", "LOW" sensitivity, and "HIGH" sensitivity. Selection of "HIGH" sensitivity in effect increases the area of reception of the beacon. The indicator lights mounted vertically in the centre of the main instrument panel illuminate upon detection of their appropriate beacon (Blue "OUTER, white "AIRWAY" and amber "INNER").

137 The audio portion of the beacon can be selected by an on-off switch on the upper panel row. The volume is pre-adjusted and is constant with the iso-amplifier "ON" or "OFF".

ILS RECEIVERS AND INDICATORS

138 The instrument landing system incorporates two receivers, R89B/ARN-5, glide path; BC-733, Localizer; and a cross pointer indicator (ID48A) incorporating a flag alarm

within each function which indicates either source or equipment failure. The system is used as a runway approach aid and is operated only by the pilot. The range of the glide path receiver is between 10 and 15 miles, and of the localizer receiver 30 to 40 miles. An "ILS" "OFF" switch controls the installation and a six-position function switch "ILS SEL" marked "U" through "Z", selects glide path and localizer reception for a particular runway approach. Also incorporated in the panel is an ILS volume control which attenuates localizer audio tone.

NOTE

An interaction exists between the VHF and the ILS installation when the AF/UTA68 VHF transceiver is selected to 119.7 Mcs and the BC-733 receiving set is selected to Channel "Y", 109.9 Mcs simultaneously. This interaction causes the ILS to indicate "on course" regardless of the aircraft location. Do not select VHF Channel 119.7 Mcs when using Channnel "Y" ILS.

INTERPHONE SYSTEM

139 An interphone system controlled by the "INTERPHONE" "OFF" switch, located next to the compass tuning meter, facilitates communication between all crew members.

ISOLATION AMPLIFIER

140 A switch for this unit is located midway along the right side of the radio panel. This switch turns on the isolation amplifier, which, in conjunction with the individual audio selection switches, permits the pilot and co-pilot to select separately any desired combinations of receivers. This switch should be selected "ON", whenever any of the radio equipment is to be used.

JACK BOX (BC-366)

141 Both navigators and the instructor have jack boxes. A selector switch, mounted on the face of the box, is marked "COMP" "VHF" "COMMAND" "INTER" and "CALL". The forward navigator and instructor have the use of "INTER" and "CALL" and the rear navigator, in addition, can control the compass ("COMP"). Selection of "CALL" overrides all operating radio systems. A pair of two-pin receptacles on the face of the box accomodates the headphones and microphone. The boxes contain individual volume controls.

OTHER CONTROLS

142 The "SPEAKER" - "PHONE" selector switches, marked "PILOTS" and "CO-PILOTS" may be selected for use with any equipment. Selection of the microphone operating switch automatically reverts the side tone to the headphones. The microphone selector switch enables selection for transmission on any available system. The voice range filter switches (the five-position switches, one operated by the pilot and the other by the co-pilot) permit the selection of "VOICE", "RANGE" or both on compass and range receivers when listening to simultaneous range transmission.

PASSENGER CARRYING EQUIPMENT

SEATING

143 Expeditors 3T and 3TM have facilities for carrying five passengers in forward facing seats, two on the left and three on the right. Normally the 3T functions as a pilot trainer and then only two right hand seats are fitted. Seats on the 3T type are non-adjustable whereas 3TM type seats are fully-reclining and are adjusted by means of a handle on the right hand side of each chair. All seats are equipped with regulation, quick-release, waist safety belts. (See Figures 1-2 and 1-3, General Arrangement Diagrams.)

BAGGAGE COMPARTMENTS

144 Two baggage compartments are provided on all Expeditor aircraft. The rear compartment is accessible from within the cabin, through the lavatory compartment, and the nose compartment may be reached only from outside, through the nose door. (See Figure 1-1). Baggage stowed in the nose is secured by straps to the compartment floor. Both compartments have a light in the roof, operated by a switch on the light base.

MISCELLANEOUS EQUIPMENT

145 On 3N and 3NM aircraft two navigational positions are incorporated, including a table and seat. The non-adjustable seats are equipped with conventional safety belts. (See Figure 1-1). A folding seat on the left side of the cabin, is provided for a navigation instructor. (See Figure 1-35). The position also includes a jack box and headphone set. Since no safety harness is fitted in this position, this seat must not be occupied during take-off or landing.

DATA AND MAP CASES

146 Map cases are provided for the pilot and forward navigator. (See Figure 1-1). These metal cases are fixed to the floor to the left of the seats, in both cases. A data case is mounted on the rear lavatory compartment bulkhead. Miscellaneous equipment stowage is provided, on navigational aircraft, on the left side of the cabin.

ASH-TRAYS

147 All positions have individual ash-trays, mounted within the fuselage walls.

RELIEF EQUIPMENT

148 A relief tube is secured by a clip beneath the pilot's seat. A chemical toilet and a relief tube are provided in the lavatory compartment 3N, 3NM and 3TM aircraft. 3T aircraft have the toilet but no relief tube in the rear position.

WINDSHIELD WIPERS

149 The two windshield wipers are controlled by a three-position switch on the pilot's sub-panel, having "FAST" (up) "OFF" (centre) and "SLOW" (down).

BLIND FLYING CURTAINS

150 Blind flying curtains (Venetian blind type) are installed on all aircraft. (See Figure 1-36). The slats slide on a pair of parallel rods, and are bound together in such a way that when in position, the training pilot's vision is obstructed, while that of the safety pilot remains unimpaired. The blinds are stowed by sliding them outboard of their extreme closed position, wrapping them in the side window curtains which fold over them, and securing the whole by a press stud. Press studs on the leading slats of both blinds interlock to secure the curtains in the blind flying position.

COVERS

151 Engine covers are not normally carried. Pitot head covers are placed behind the rear bulkhead fire extinguisher, carburettor and air inlet duct covers are placed behind the parachutes on the left hand cabin wall. On 3TM aircraft, pitot head covers, and inlet duct covers are stowed in the pilot's map case.

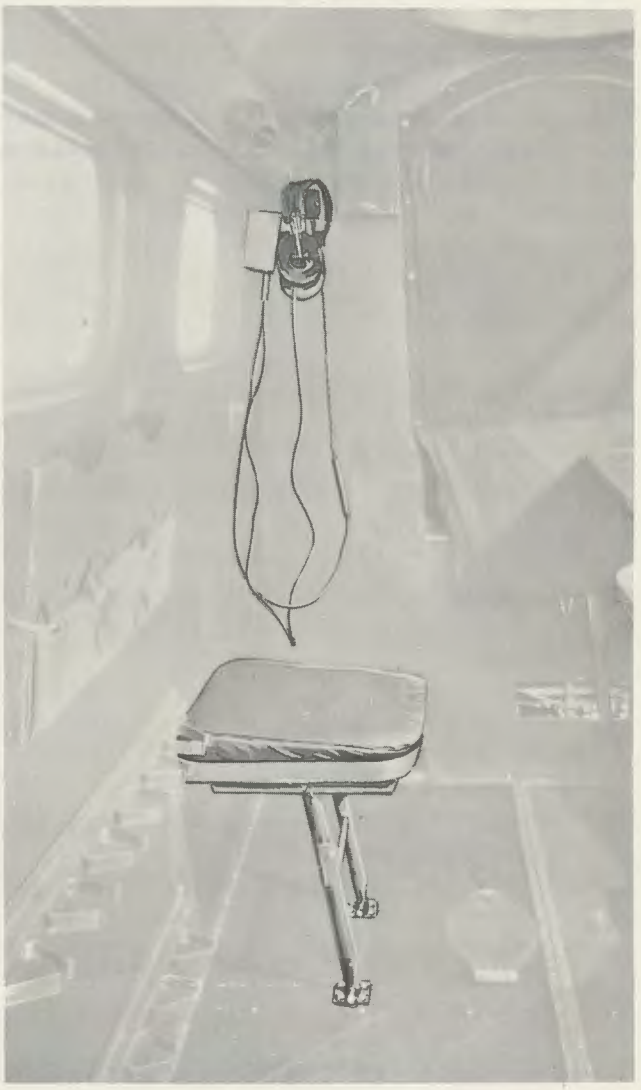


Figure 1-35 Navigation Instructor's Seat

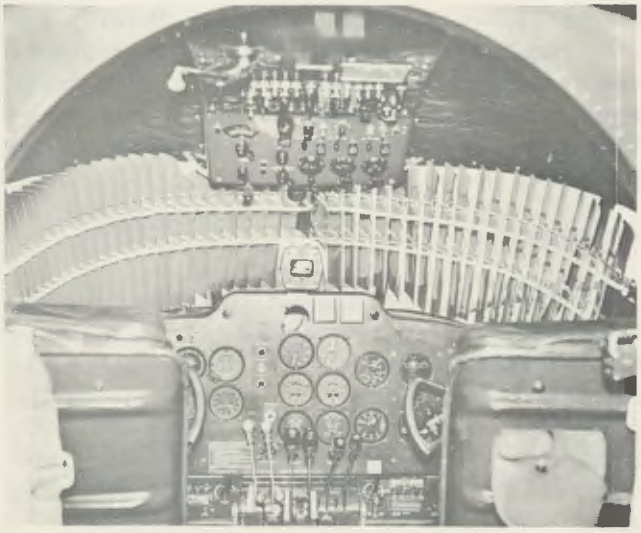


Figure 1-36 Blind Flying Curtain Installation

PICKETING ROPES

152 When picketing ropes are carried they are placed between the rear cabin bulkhead and the sleeping bag stowage or, where possible, in the rear baggage compartment.

BATTERY CARD HOLDER

153 A sheet metal holder for the Battery Card is mounted on the rear cabin bulkhead. (See Figure 1-1).

WEIGHT AND BALANCE DATA SHEET

154 The weight and balance data sheet is mounted on the partition between the lavatory and baggage compartments.

CABIN - COCKPIT PARTITIONING CURTAIN

155 On 3N, 3NM & 3TM aircraft, a curtain which partitions the cockpit from the cabin is fitted to the rear of the main spar bulkhead by press studs. It is opened and closed by the action of a long zipper.

PART 2

HANDLING

INTRODUCTION

1 This part contains the procedure to be adopted by aircrew in the operation of Expeditor 3 aircraft. Commencing with the pre-flight preliminaries, and aircraft weight and balance analysis, step by step actions are listed covering pre-flight checks, starting, taxiing, take-off, flying functions and characteristics, landing, and post flight procedures. Another section repeats this operation but expands it for conditions of cold weather operation.

PRELIMINARIES

2 Ascertain the total all-up weight of the aircraft, and the centre of gravity position of the 'before flight' configuration (CG Limits 109.8 inches and 117.7 inches aft of datum). Check the balance for take-off, flying, and landing conditions. As the landing gear retracts the centre of gravity moves aft. (See EO 05-45B-8, Weight and Balance Data).

3 Determine the length of runway required for take-off and landing by referring to Figure 4-2 Take-Off Chart, using the weight of the aircraft, the altitude of the airstrip, the ambient temperature and the strength of headwind.

4 Determine the engine operating conditions to be used during the flight, in order to obtain the desired range and speed. (See Figure 4-6). Study also the single-engine flying characteristics at the gross weight of the aircraft. (See Figure 4-7). Determine whether any other limitations have been imposed on the aircraft and abide by them in flight. Ensure that safety and emergency equipment is carried, as required by Unit Orders, and that the aircraft is fit to fly, in all other respects, by checking the maintenance Form L14.

PRE-START CHECKS

5 Observe the general condition and position of the aircraft, and check that the area is clear of ground equipment.

6 Enter the cockpit and carry out the following checks:

Undercarriage Selector	Check "DOWN".
Controls	Unlock and secure the control lock in its floor stowage.
Fuel	Check contents
Battery Switch	As required.
Propeller Anti-icers	Check Operation and tank contents.
Mixture	Ensure in Idle Cut-off.
Trim tabs	Check for full travel and return to neutral.
Flaps	Fully down and selector "OFF".
Switches	All "OFF".

EXTERNAL CHECK

7 Start external check at main door. Check the items in the sequence indicated in Figure 2-1 (Sheets 1 and 2), External Inspection Diagram.

CAUTION

During the external check, ensure that the propeller has been turned through at least three revolutions by hand.

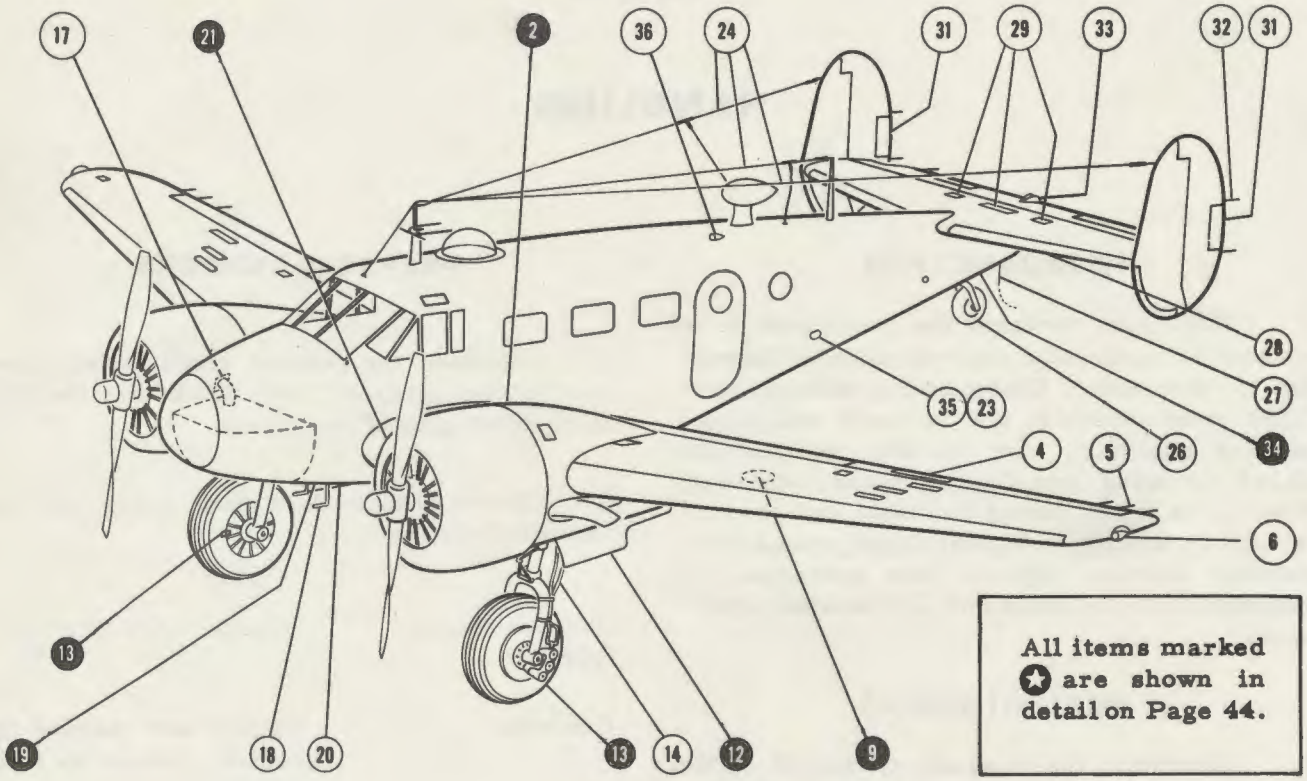


Figure 2-1 External Inspection Diagram

Left Wing

1	Mainplane	Check condition, and ensure surfaces free of frost, snow and ice. See that access panels are secure.
❷	Fuel and Oil Filler Caps	In place.
3	Flap and aileron	Surfaces clean and undamaged. Hinges undamaged.
④	Trim Tab	Check against neutral setting of cockpit control.
⑤	Bonding Wires and Static Dischargers	Undamaged
⑥	Lights	Wing tip navigation light and reflector clean and undamaged.
7	De-icers	Leading edge de-icer boots free of cuts, cracks and splits.
8	Undersurfaces	Underside of mainplane and flap undamaged.
❾	Landing Lights	Clean and undamaged.

Left Engine and Nacelle

10	Covers	Removed. Inlets unobstructed.
11	Cowlings	In place. Locks fastened. Access panels replaced. Examine for accumulation of oil indicating oil leaks.
⓬	Wheel Well	Undercarriage doors linked. Slide tube clean.
⓭	Wheel	Chock in place. Tire: free of cuts, cracks and holes. Creep (1/2 width of creep mark is maximum permissible). Inflation (see Figure 2-2). When tire is correctly inflated the distance

		between centre of axle and ground is 12-3/4 inches. Oleo extension should be approximately 2-1/2 inches (minimum 1-1/2 inches).
⑭	Brake Hoses	Connections securely made. Hoses undamaged.
15	Propeller	Blades and hub free of cracks and nicks. Check for oil leaks, and condition of propeller anti-icer equipment.

Centre Section

16	Nose Compartment	Baggage and equipment securely stowed. Door secured
⑰	Nose Fuel Tank	Filler cover in place.
⑱	Pitot Tubes	Clean and undamaged. Covers removed and stowed.
⑲	Fire Extinguisher Disc.	Red
⑳	Antenna	Belly antenna tight, clean and securely mounted.
㉑	Oil Cooler Air Inlet	Blanking covers removed.

Right Wing, Engines and Nacelle

Check as for left wing engine and nacelle in the reverse order (item 4 not applicable).

Right Fuselage

22	Drift Meter and Drift Recorder	Clean and undamaged (3N and 3NM only).
㉓	Static Vent	Unobstructed.
㉔	Top Antennae	Tight, clean and securely mounted.
25	Fuselage Anti-Collision Light	Surfaces undamaged. Undamaged.

Tail Gear Assembly

㉖	Wheel	Tire: free of cuts, cracks and holes. When correctly inflated, distance between ground and centre of axle is 6 inches. Creep mark alignment. Oleo extension should be approximately 3 inches.
㉗	Static Ground Wire	In contact with ground.

Empennage

㉘	De-icers	Boots free of cuts, cracks and splits.
㉙	Panels, Plugs and Fairings	In place.
30	Stabilizers	Vertical and horizontal metal and fabric surfaces undamaged (The tailplane is a critical area, subject to damage by debris carried in the slipstream or thrown up by the tires). Check bonding wire.
㉛	Trim Tabs	Check against neutral setting of controls in cockpit.
㉜	Static Dischargers	Undamaged.
㉝	Navigation Lights	Clean and undamaged.
㉞	Tail Cone	Drain unobstructed (see Note, Part 2, Paragraph 63, Item 6.

Left Fuselage

㉟	Static Vent	Unobstructed.
㊱	Navigation Lights	Upper and lower lights clean and undamaged.
37	Fuselage	Surfaces undamaged.

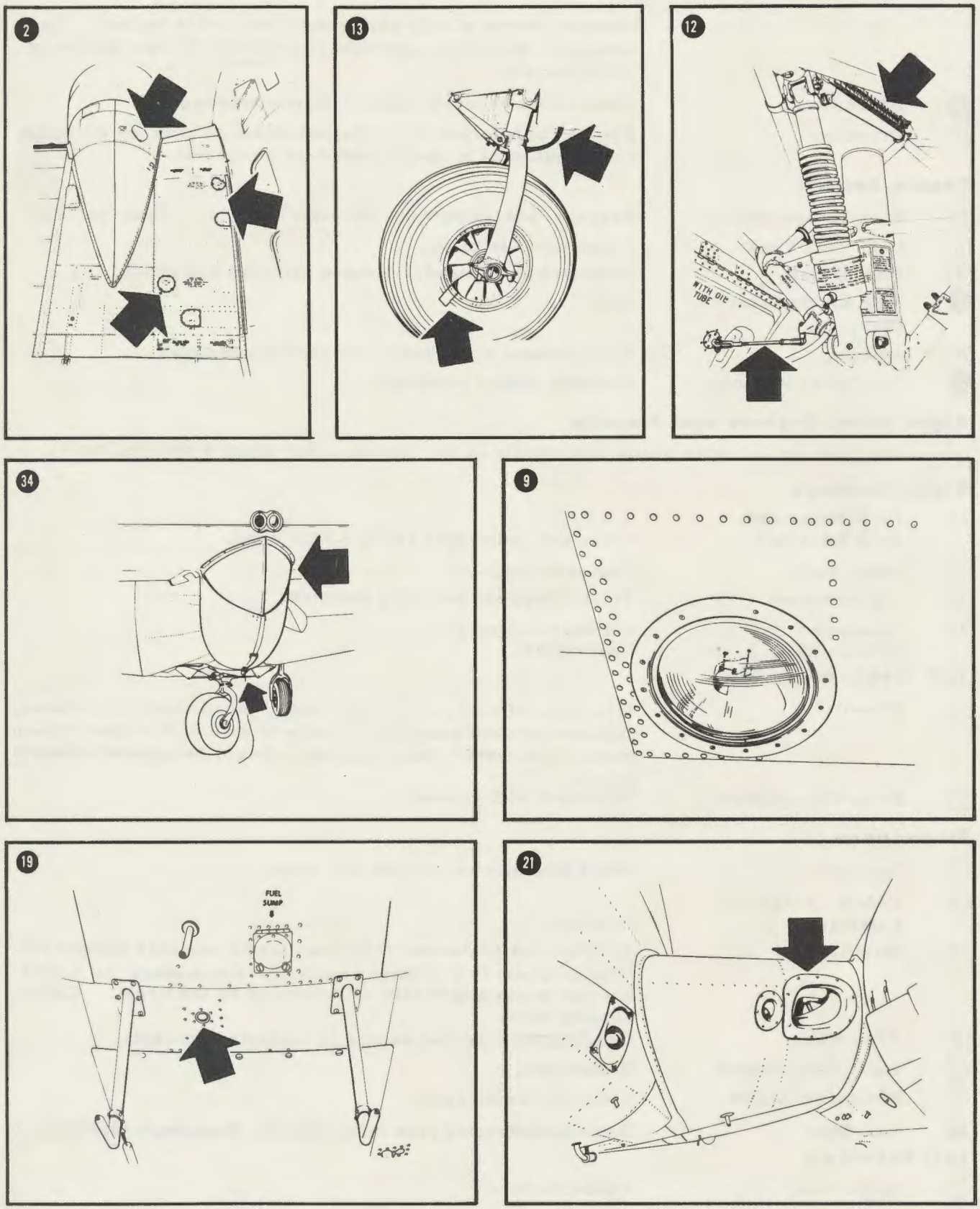


Figure 2-2 External Inspection

INTERNAL CHECK

8 Enter the aircraft and carry out the following checks:

(a)	Rear Compartment	
(1)	Communications Equipment	Securely mounted.
(2)	Baggage	Baggage and equipment properly stowed.
(3)	First Aid Kit	In place on the rear of the lavatory door, and seal unbroken. Door closed.
(b)	Main Cabin Compartment	
(1)	Rear Fire Extinguisher	Seal unbroken, and pressure gauge reading approximately 150 psi. (in extremely low temperatures this pressure will drop by approximately 10 psi.)
(2)	Main Door	Secured
(3)	Rear Bulkhead	Spare bulb container fully equipped (See chart in cover). Forced landing instructions and emergency maps in place. (See Part 1 paragraph 118 for alternative locations.)
(4)	Safety Equipment	Carried and stowed in accordance with Unit Orders.
(5)	Emergency Exit	Exit panel on starboard side of cabin securely closed.
(6)	Astrodome	Secure, with release toggle in place in retaining clips. Astro compass and sextant mounting undamaged. (3N and 3NM).

COCKPIT CHECK

9 Perform cockpit check below:

(a)	Signal pistol and cartridges	Check correct stowage.
(b)	Seat and Safety Belt	Adjusted.
(c)	Cross Feed	"OFF"
(d)	Parking Brakes	Reset "ON"
(e)	Oil Shut-off Valve	In (open) - (3N, 3NM and 3TM) safety wire unbroken.
(f)	Oil By-Pass	"PULL-HOT" (by-pass).
(g)	Fuel Selectors	Both on "NOSE".

(h)	Flaps	Raise flaps checking manual and electrical operation. Return selector to "OFF" position.
(j)	Cowl Flaps	Check operation. Set "OPEN".
(k)	Manifold heat	"COLD", tension released.
(m)	Pitch	Propeller controls fully forward (Fine Pitch).
(n)	Throttles	Cracked, i.e. about 1/8 open. (If throttles are opened too wide the tendency to backfire is increased.)
(p)	Mixture	Fully forward (rich).
(q)	Oil Shutters	Closed.
(r)	Battery	External power supply "ON", aircraft battery and generator "OFF" (unless aircraft batteries to be used for starting.)
(s)	Circuit Breakers	Reset where necessary (See Figures 1-13 and 1-14).
(t)	Radios	All "OFF".

10 Make the following additional checks for night flights:

(a) Check operation of all exterior lights.

(b) Check magnetic compass light. Spare miniature bulbs are located on right subpanel.

(c) Check instrument lighting.

(d) Check pilot's compartment and cabin lighting and reel-type extension light behind co-pilot's seat (3N and 3NM) underneath co-pilot's seat (3T and 3TM).

STARTING PROCEDURE

11 Carry out the following procedure. (Note field barometric pressure as indicated by the manifold pressure gauge).

(a)	Fire Guard	Standing by with extinguisher.
(b)	Fire Extinguisher	Select Right Engine.
(c)	Priming	Operate the wobble pump to build up fuel pressure to three or four pounds. Prime starboard engine seven full strokes for cold engines (10 to 15 strokes if OAT is below -20°C) and three to four strokes for warm engine.

NOTE

Do not overprime the engines. The raw gasoline will wash oil from the cylinder walls, creating excessive wear conditions. Pumping the throttles does not prime the engine. It merely floods the carburettor and may create a fire hazard.

NOTE

Use of manifold heat during starting may result in serious damage and fire if the engine backfires. Manifold heat levers will tend to move into "hot" position during backfiring. Return the levers to "COLD" but do not hold or lock in position.

(d)	"ALL CLEAR" Signal	Give "Thumbs Up" signal to ground crew, and readiness to start engine will be indicated by ground crew giving a circular motion of the right-hand at head level with the left-hand pointing to the engine.
(e)	Starter selector	Select "RIGHT" engine.
(f)	Starter	Depress starter button. Allow engine to turn over eight blades.
(g)	Switches	Ignition switches "ON".
(h)	Booster	Engage booster, and hold until engine is running smoothly.

CAUTION

If starting difficulties are encountered limit continuous operation of starter and booster to periods of less than 30 seconds duration. Allow equipment to cool for two to three minutes between attempts.

(j)	Oil	Check pressure (if it does not build up to 20 psi within 30 seconds shut off engine).
(k)	Suction	Check suction (3.75 in. to 4.6 in Hg).

CAUTION

If engine backfires, close throttle immediately.

12 Start port engine as follows:

(a)	Fire extinguisher	to "LEFT ENGINE".
(b)	Priming	Prime port engine as in paragraph 11 (c).
(c)	Starter selector	to "LEFT".
(d)	Start engine in accordance with procedure outlined in paragraph 11 (e) to 11 (g).	
(e)	Battery	External power supply disconnected. Aircraft battery switch "ON". Generator switches "ON".
(f)	Inverter and compass	Slaving switches "ON".

FAILURE TO START PROCEDURE

13 If an engine fails to start:

(a) Release starter and booster buttons.

(b) When propeller stops rotating switch ignition switches "OFF".

(c) Allow starter to cool (2-3 minutes).

NOTE

If the engine has been overprimed switch off ignition switches, move mixture control to Idle Cut-Off. Open throttle slowly to fully open position and have the engine turned over two or three revolutions by hand in direction of rotation.

(d) Repeat starting procedure:

(e) If re-starting is impossible, carry out shut down procedure (Paragraph 60 this part).

WARMING UP PROCEDURE

14 To warm up the engines use the following procedure:

(a) During the first 30 seconds after starting allow the engines to run at low speed - approximately 700 rpm.

(b) Adjust throttles to approximately 1000 rpm for warm-up. Do not run up at more than 1000 rpm until the oil temperature reaches 40°C.

(c) When the oil temperature has reached 40°C move the oil by-pass valve SLOWLY to the cold position ("in") position. At this point an oil temperature drop should be observed if coring is not present.

TARMAC CHECK

15 Whilst the engines are warming up perform the following checks:

(a)	Floor	A systematic check of all floor items.
(b)	Pedestal	A systematic check of all pedestal items.
(c)	Main Instrument Panel and Sub-panel.	A systematic check from left to right, to cover all controls, instruments and switches. (See Figures 1-12, 1-13, 1-14, 1-15 and 1-16).

Check particularly the following items:

(1)	Landing Light Switches	"OFF".

ADVANCE REVISION

Serial #1 dated 22 Sep 60
(Sheet 1 of 4)

The sheets of this Advance Revision are to be inserted in the EO as follows:-

Sheet 1 facing page 49
Sheet 2 facing page 51
Sheet 3 facing page 52
Sheet 4 facing page 59

Part 2, HANDLING, TAXIING PROCEDURE, page 49, para. 16, Pre-Taxi Check.

Insert new para. (d) landing lights on for night taxiing.

Caution must be exercised to avoid blinding marshallers and pilots of other aircraft.

Renumber paras. (d), (e) and (f).

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

(2)	All Indicating Lights	Press to test.
(3)	Leading Edge De-icer Boot	Check operation and gauge pressure (see Part 1 paragraph 86). Turn "OFF" system.
(d)	Radio Panel	A systematic check from left to right (including switching on and tuning all units).

TAXIING PROCEDURE

16 Pre-taxi check:

(a)	Fuel	Rear Tanks
(b)	Tail Wheel	Unlock (Pull and turn handle).
(c)	Chocks	Signal for removal.
(d)	Parking Brakes	Release (press tips of pedals on pilot's side).
(e)	Brakes	Check operation.
(d)	Landing lights on for night taxiing.	Caution must be exercised to avoid blinding marshallers and pilots of other A/c.

CAUTION

Before moving the aircraft ensure that all gyro instruments are uncaged to prevent damage during taxiing.

(f)	Instruments	Check during taxiing that gyro instruments operate correctly.

ENGINE AND ACCESSORY CHECK

17 Perform the following checks:

(a)	Parking brakes	"ON"
(b)	Magnetos	At minimum rpm switch off each magneto in turn. Switch off both together momentarily to check grounding out.
(c)	Idle	1000 rpm.
(d)	Fuel	Front tanks.
(e)	Temperatures	Within limits for run-up.
(f)	Power	Open both throttles to 1500 rpm.
(g)	Generators	Depress voltmeter buttons in turn. Indication should be 28 volts maximum, 25 to 27, volts normal. Check ammeters indication; Generator warning lights OUT.

(h)	CSU	Move propeller control to coarse pitch (fully back) and check rpm drop, minimum 300 rpm. Return to fine pitch.
(j)	Feathering	Depress each feathering button in turn until a decrease in rpm occurs (200 - 300 rpm). Then pull out the button.
(k)	Manifold Heat	Operate each manifold heat control to give a 10 degree rise in carburettor temperature.
(m)	Mixture	Move mixture control slowly back until a slight drop in rpm is noted. Return to fully rich position.

(n) Return throttles to 1000 rpm.

Power Check:

(p)	Throttle	Advance starboard throttle until the manifold pressure reading is equal to the existing field barometric pressure. The engine speed obtained should be the reference rpm as placarded.
(q)	Magnetos	With the throttle in the same position check the magnetos. The maximum permissible drop is 65 rpm.
(r)	Temperatures and Pressures	Check within limits.
(s)	Idling	Throttle back slowly and check idling (500 to 600 rpm).

(t) Idle starboard engine at 1000 rpm, and repeat procedure for port engine.

TAKE-OFF PROCEDURE

PRE-TAKE-OFF CHECK

18 Before positioning on the runway for take-off perform the following checks:

(a)	H - Harness	Harness adjusted, inertia reel locked. Check passengers and crew.
	Hatches	Door and windows closed.
(b)	T - Trim	Rudder and aileron neutral, elevator approximately one-half unit nose down.
	Tension	Adjust the three friction locks tight enough to maintain selections.
	Temperatures and Pressures	Ensure temperatures and pressures are within take-off limits.
(c)	M - Mixture	"RICH" (fully forward).
	Manifold heat	"COLD" (up).

Part 2, HANDLING, TAKE-OFF, page 51, para. 19.

Insert NOTE after para. (c).

Techniques for night take-off are the same as for normal take-off, except that it is recommended that landing lights be used. Under conditions of restricted visibility such as haze, fog, snow or rain, when the pilot is of the opinion that the use of landing lights is a hindrance, rather than an aid to visibility, landing lights will be used at the pilot's discretion.

(d)	P - Pitch	"FINE" (fully forward).
(e)	F - Fuel	Check "FRONT" tanks selected. Check contents. Cross-feed "OFF", Primer "OFF".
	Flaps	As required.
(f)	G - Gills	Cowl flaps on 'Trail'
	Oil Shutters	As required.
	Oil By-Pass	Open (Push-in).

NOTE

Cylinder head temperature will increase 25°C to 30°C during take-off. Before commencing take-off run temperatures must be sufficiently low to prevent this rise from exceeding the maximum allowable temperature of 260°C. This temperature is allowable for five minutes only.

	Gyros	Check - set and uncaged.
(g)	S - Switches	Batteries "on" Generators "on" Magneto Switches "on" De-icer boots "OFF" Pitot heaters "on"
	Anti-Collision Light	On (at night, switch navigation lights to steady).
	Suction	3.75 to 4.6 inches
(h)	Controls	Check for freedom and proper movement.
(j)	Take-off Briefing	Ensure first officer understands procedures.
(k)	Tail Wheel	Locked on runway.

WARNING

The lavatory compartment on all types, and the collapsible seat (jump seat) on the 3N and 3NM, must not be occupied during take-off.

TAKE-OFF

19 For normal take-off, proceed as follows:

(a) While on final turn on to runway, lock tail wheel (turn and depress control). Allow aircraft to roll straight for a few feet when lined up, so that tail wheel locking pin will engage.

(b) Advance both throttles smoothly to full take-off power of 36 inches manifold pressure.

(c) Aircraft should be ready to fly off between 65 and 75 knots IAS. Safety speed 80 knots.

WARNING

Be sure that sufficient speed has been attained before raising landing gear. The retraction mechanism will probably be damaged if wheels are allowed to touch the ground after landing gear has started to retract.

MINIMUM RUN TAKE-OFF

20 To carry out a precautionary or short field take-off, line the aircraft up on the runway in the normal manner, then proceed as follows:

Techniques for night take-off are the same as for normal take-off, except that it is recommended that landing lights be used.

(a) Flaps - Extend 10 degrees.

(b) Brakes - Applied.

(c) Throttle -

(1) Open to 30 inches manifold pressure and release brakes.

(2) Advance to 36 inches manifold pressure.

(d) Tail Wheel - Raise tail wheel from runway as soon as possible after aircraft is rolling.

(e) Control - When the aircraft reaches flying speed (65 to 70 knots) pull aircraft off the ground firmly and decisively.

(f) Undercarriage - When assured aircraft will remain airborne, raise the undercarriage

(g) Post Take-off Check - After the aircraft has reached safety speed (80 knots) follow normal post take-off procedures.

CROSS-WIND TAKE-OFF

21 In a cross-wind take-off initial directional control is maintained by slow differential throttle opening. After rudder control is attained control is maintained by coarse use of rudder. The aircraft is held on the ground until adequate (75 to 80 knots) flying speed is attained, then lifted cleanly from the ground. On no account must the aircraft be allowed to touch the ground after crab is established. The application of into-wind aileron throughout the take-off run will aid in maintaining directional control and reduce the tendency of into-wind wing lifting.

NOTE

The aircraft should not be operated when the surface wind velocity exceeds 40 mph including gusts. Cross-wind take-offs are not to be attempted when the cross-wind component exceeds 15 mph at 90°. (See Figure 2-3, Crosswind Component Graph).

(a)	U Undercarriage	Select "UP". Check red light ON.
(b)	F Flaps	"UP" at a safe altitude.
(c)	P Power	Recommend manifold pressure 28 inches rpm 2000.
(d)	T Temperatures and Pressures	Check - within limits.
(e)	Landing lights retracted.	

NOTE

If landing gear will not retract follow procedure as outlined in Part 1 paragraph 66.

CLIMB

22 After becoming airborne carry out the following actions:

POST TAKE-OFF CHECK

23 Maximum take off power, 36 inches manifold pressure and 2300 rpm, must be maintained for only one minute. A suggested climbing power for average conditions is 28 inches manifold pressure and 2000 rpm. After the post take-off check has been completed obtain a recommended climbing IAS of 105 knots.

24 Economical power settings for climbing are shown in Figure 4-3. Data given indicates the rate of climb to be maintained through altitude increments of 5000 feet. The calibrated air speed, manifold pressure, and the fuel consumed from take-off together with the distance traversed and the time taken to reach a particular altitude, are recorded for different weights of the aircraft.

CRUISING FLIGHT

LEVELLING OUT

25 When the desired cruising height and

Part 2, HANDLING, page 52, para. 21.
P
Delete Post take-off check paras. (a), (b), (c), (d), para. 21 and insert at end of para. 23.

Insert new para. (d) in Post take-off check.

(d) Landing lights retracted.

Renumber existing paras. (d) to para. (e).

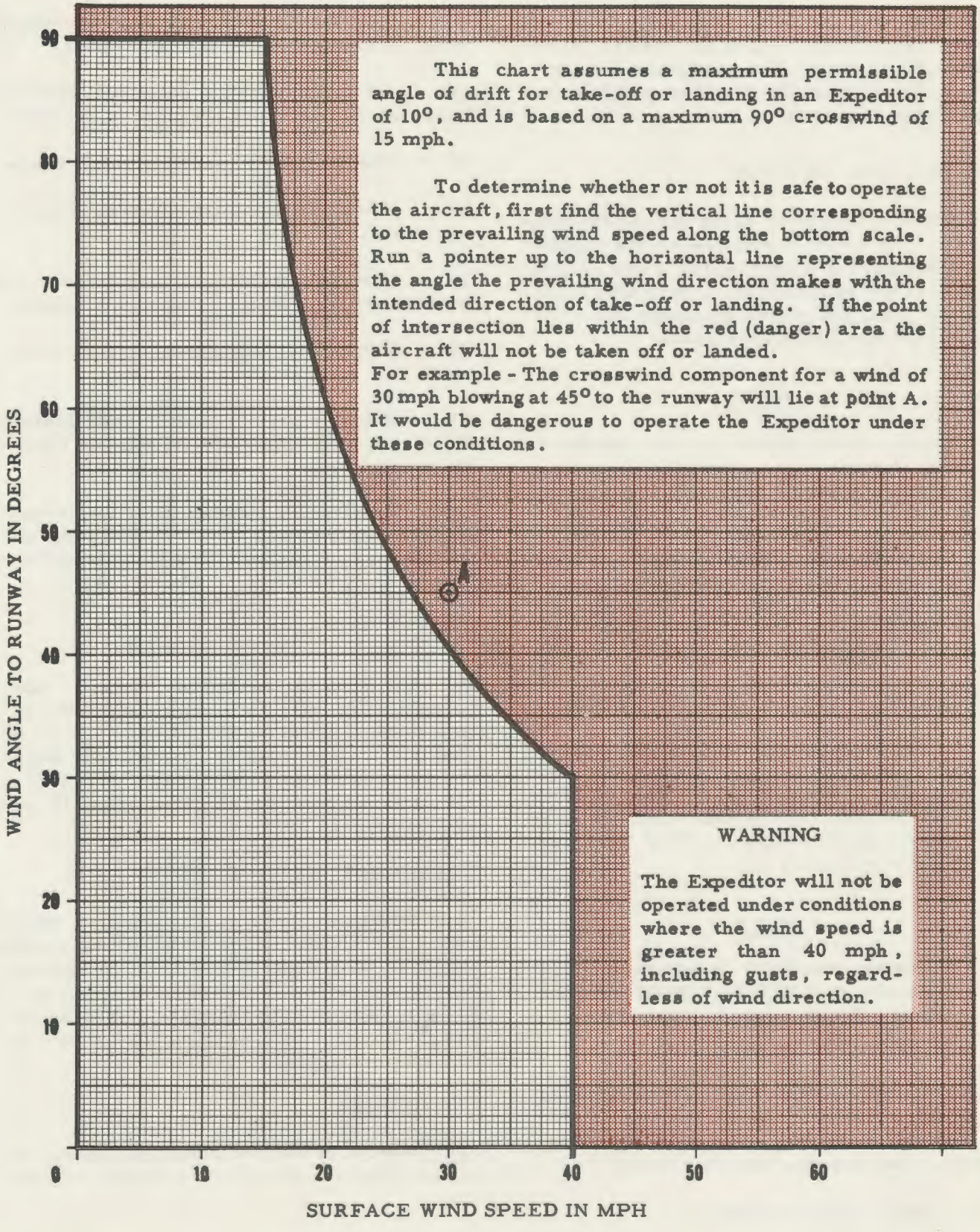

This chart assumes a maximum permissible angle of drift for take-off or landing in an Expeditor of 10°, and is based on a maximum 90° crosswind of 15 mph.
To determine whether or not it is safe to operate the aircraft, first find the vertical line corresponding to the prevailing wind speed along the bottom scale. Run a pointer up to the horizontal line representing the angle the prevailing wind direction makes with the intended direction of take-off or landing. If the point of intersection lies within the red (danger) area the aircraft will not be taken off or landed.
For example - The crosswind component for a wind of 30 mph blowing at 45° to the runway will lie at point A. It would be dangerous to operate the Expeditor under these conditions.
A
WARNING
The Expeditor will not be operated under conditions where the wind speed is greater than 40 mph, including gusts, regardless of wind direction.
WIND ANGLE TO RUNWAY IN DEGREES
90
80
70
60
50
40
30
20
10
0
10
20
30
40
50
60
SURFACE WIND SPEED IN MPH

Figure 2-3 Crosswind Component Graph

airspeed are reached, reduce the manifold pressure and rpm to give the desired horsepower for cruising. (See paragraph 27 below). Place the mixture in the lean position (see paragraph 26 below).

LEANING THE MIXTURE

26 Select lean mixture by moving the mixture control lever slowly toward the "LEAN" position until the engine begins to run roughly; then ease the control lever toward the "RICH" position until the engine smoothes out. Repeat procedure for other engine.

NOTE

Observe the airspeed and the cylinder head temperature after the leaning process has been completed. If too lean a noticeable drop in airspeed and a rise in cylinder head temperature will be noted. Experience dictates that correct leaning will affect airspeed only slightly and will usually bring cylinder head temperature up 20° to 30°C from the full rich position.

POWER SETTINGS AT MAXIMUM BMEP

27 The combinations of manifold pressure and rpm in Table 2-1 will produce the maximum allowable brake mean effective pressure (BMEP) for the mixture lean condition. Do not exceed the following manifold pressures for the corresponding rpm.

NOTE

Decrease manifold pressure by 0.5 inches for each 10°C that the Carburettor Mixture Temperature is below the standard OAT.

FLYING THROUGH SEVERE TURBULENCE

28 Before entering an area of severe turbulence, perform the following check:

(a) Secure all loose gear.

(b) No smoking. Seat belts fastened.

(c) Turn fuel tank selector valves to fullest tanks, preferably to the two front tanks.

(d) Set engine speed to 2000 rpm, mixture fully rich, and decrease airspeed to 130 knots.

(e) Check all instruments and align gyros.

(f) If icing is anticipated, turn on propeller anti-icers.

(g) If severe lightning is expected, turn all interior and instrument lights on full bright.

(h) Turn off all unnecessary radio equipment.

(j) If heavy precipitation is encountered, close cowl gills to prevent the engines cooling off too rapidly.

(k) Keep aircraft within flight limitations. Once the aircraft has been trimmed properly, further use of the trim tabs to recover from climbs or dives is not recommended.

FLYING FOR MAXIMUM RANGE

29 To achieve maximum range, under normal useful load conditions, adjust the engine speed to a low setting. Minimum in-flight rpm (i.e. 1700 rpm) is recommended. Adjust the manifold pressure to obtain an airspeed of 125 knots IAS. Adjust mixture control to lean as in paragraph 26.

FLYING FOR MAXIMUM ENDURANCE

30 To achieve maximum endurance under most normal load conditions set the engine speed at 1700 rpm, and adjust the manifold pressure to give a recommended airspeed of 95 knots IAS; move the mixture control levers away from the FULL RICH position, until the best mixture setting is obtained.

FEATHERING

31 When it is desired to test the feathering action in flight carry out the following procedure:

(a) Check that the feathering oil dilution

	Std. Temp	RPM			
		1700	1800	1900	2000
Sea Level	15°C	30.5	30.5	30.5	30.5
2000 feet	11°C	29.5	29.5	29.5	29.5
4000 feet	7°C	29.0	29.0	29.0	29.0
6000 feet	3°C	28.0	28.0	28.0	28.0
8000 feet	-1°C	26.5	27.0	27.5	27.5
10,000 feet	-5°C	24.8	25.5	25.5	26.5
Limiting BHP		253	268	283	298
Approximate Fuel Consumption (Imp. Gals/hour)		33	35	37.5	40

Table 2-1 Power Setting Chart

switch is in the "WINTER" position if the OAT is below 0°C.

(b) Check that both generators are charging.

(c) Throttle - closed.

(d) Propeller - Fully "coarse".

(e) Mixture Control - Idle Cut-off.

(f) Ignition Switches "OFF".

(g) Feathering button - Depress.

(h) Fuel - Tank Selector "OFF" cross feed "OFF".

(j) Generator - Switch "OFF".

NOTE

If the OAT is below 0°C exercise the propeller twice through its entire pitch range before feathering. Practice feathering must NOT be carried out when OAT is below minus 10°C.

UNFEATHERING

32 To unfeather the propeller proceed as follows:

(a) Feathering oil dilution switch to the SUMMER position.

(b) Fuel - Tank Selector "on".

(c) Feathering Button - Hold button in until 600 rpm is attained. Then release.

(d) Ignition switches "on".

(e) Mixture Control - Rich.

(f) Generator - Switch "on".

(g) Warm the engine up at low power setting before returning to normal cruising power.

NOTE

No more than one feathering and unfeathering action "per engine" shall be carried out during any one hour period. If the propeller remains feathered for

longer than two minutes rotate the engine two revolutions using the starter, before unfeathering, to ensure that there is no hydraulic lock.

MANAGEMENT OF THE FUEL SYSTEM

FUEL TANK SELECTION

33 Two fuel tank selectors "LEFT" and "RIGHT" control the feed from the tanks to the engines.

(a) Left Engine - The left fuel tank selector is marked "LEFT FRONT" "LEFT REAR", "NOSE" and "OFF". To supply fuel to the left engine only from either of the three tanks move the selector switch to the appropriate designation. Each designation has a positive selection position.

(b) Right Engine - The right fuel tank selector operates in the same manner as the left selector and supplies the right engine only.

FUEL TRANSFER

34 To cross feed fuel from one mainplane to the engine on the opposite side, (e.g. left mainplane to right engine) make the following selections:

(a)	**Suction Cross Feed**	**"ON"**
(b)	**Right Fuel Tank Selector**	**"OFF"**
(c)	**Wobble Pump**	**Operate during transfer to maintain pressure above 3 p.s.i.**

WARNING

When the cross-feed cock is ON, fuel from whichever tank is selected is supplied to both engines. If either engine is inoperative therefore, cross feed should NOT be used, as the inoperative engine could under certain conditions represent a fire hazard.

FUEL TANK LIMITATION

35 Avoid running the tanks dry for two reasons. First, the possibility of detonation and air lock exists, with resultant engine failure or inability to regain fuel pressure. Second, damage to the liquidometer float and the fuel tank is caused by vibration during flight if the float is allowed to rest on the tank bottom.

36 Always take off and land on main tanks. When accelerating in a nose-high attitude and the fuel level in the rear tanks is low, it is possible that the fuel will not feed to the engines. For this reason do not use rear tanks under such conditions. CG limitation must be complied with for "tanks full" and "tanks empty" conditions. However in order to preserve the balance of the aircraft, tank selections must vary according to configuration.

WARNING

Erroneous indications of fuel remaining in the nose tank and engine cutting may occur under conditions where the nose fuel tank vent line becomes blocked by icing or any other foreign object. When icing conditions are anticipated, pilots should make careful note of the contents of the nose fuel tank, and if a misreading is suspected pilots should use the nose tank on a time basis only, based on fuel consumption figures for the aircraft, allowing a good time safety margin in their fuel management. No attempt should be made to run the nose tank down to nearly empty under these conditions.

TANK SELECTION

37 Select the tanks as follows:

(a) When the aircraft is operated as a transport with all five cabin seats occupied, the fuel tanks must be selected in the following order: (1) rear wing tanks; (2) front wing tanks until 3/4 of supply is used; (3) nose tank; (4) front wing tanks. If it is necessary to reduce the quantity of fuel carried to stay within the maximum allowable gross weight of 9300 pounds, such fuel should be left out of the rear wing tanks.

(b) When the aircraft is operated with only

the pilot's and co-pilot's seats occupied, the fuel tanks should be selected in the following order: (1) nose tank; (2) rear wing tanks; (3) front wing tanks.

(c) During navigational training flights the tanks should be selected in the following order: (1) Rear wing tanks (2) Nose tank (3) Front wing tanks.

FLIGHT CHARACTERISTICS

GENERAL

38 Normal characteristics for twin-engine aircraft of its type. The Expeditor has no pecularities, and no dangerous tendencies.

STALLING PRE TAKE OFF CHECK

39 Stall characteristics are good, with no tendency to spin. Ample stall warning is indicated by considerable buffeting of tail surfaces and sloppy controls. There is adequate aileron and rudder control throughout the stall, and the aircraft will mush considerably before the nose drops. To recover, drop the nose slightly and apply power. Approximate stalling speeds are as follows:

(a) Power ON - Flaps and landing gear UP - 75 knots IAS.

(b) Power ON - Flaps and landing gear DOWN - 70 knots IAS.

(c) Power OFF - Flaps and landing gear UP - 80 knots IAS.

(d) Power OFF - Flaps and landing gear DOWN - 75 knots IAS.

SPINNING

40 Intentional spins are prohibited. In the event of unintentional spinning normal spin recovery action is employed.

AEROBATICS

41 Aerobatic manoeuvres are prohibited.

DIVING

42 The aircraft becomes slightly tail-heavy as speed increases in a dive, but there is no tendency to yaw.

CAUTION

Do not exceed 220 knots at any time. Do not exceed 175 knots in rough air. Maximum allowable rpm is 2350. Cowl flaps should be closed during the dive.

NOTE

Any engine speed in excess of 2350 rpm must be reported in the form L14 as a major unserviceability.

HEATING AND VENTILATING

COCKPIT, EXPEDITORS 3N, 3NM AND 3TM

43 To obtain maximum heat in the cockpit:

(a) Close both controls ("HOT" position) on the pedestal.

(b) Close both controls ("PULL HOT") in the floor outboard of the rudder pedals.

(c) Turn both inlet louvres so that the inlets face forward (maximum volume). (See Figure 2-4, Maximum Flow Positions of Inlet Louvres).

44 To obtain maximum cold air in the cockpit:

(a) Open both pedestal controls ("COLD position) (allowing hot air to spill to atmosphere).

(b) Open both floor controls ("PUSH COLD").

(c) Turn both inlet louvres forward (maximum volume) (See Figure 2-4).

45 Intermediate positioning of these controls varies the mixture of hot and cold air and varies the inlet temperature. On 3T aircraft cold air controls are behind the pilot's and copilot's seats.

CABIN, EXPEDITORS 3N, 3NM and 3T

46 To obtain maximum heat in the cabin:

(a) Close both controls ("HOT" position) on the pedestal.

(b) Turn inlet louvres on cockpit floor so that inlet faces aft (no flow).

(c) Turn the astrodome de-frosting valve off (3N and 3NM only).

(d) Turn off cold air inlet valves.

NOTE

When the floor louvres in the cockpit are facing aft no air can enter the cockpit. The build up of air causes a greater volume to flow to the defroster and to the cabin, thereby increasing the cabin heat.

47 To obtain maximum cold air in cabin:

(a) Open both pedestal controls (allowing hot air to spill to atmosphere).

(b) Open the cold air valves on the main spar bulkhead (Pull - Cold). On type 3T turn valve cock outboard of crew seats anti-clockwise.

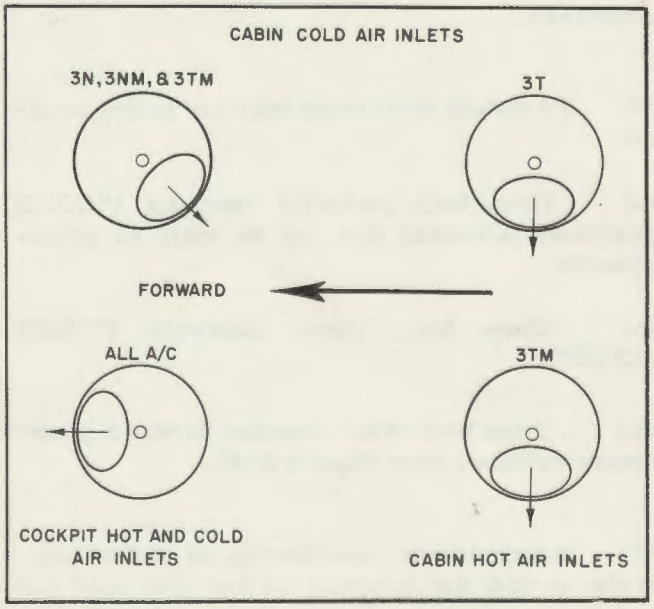


Figure 2-4 Maximum Flow Position of Inlet Louvres

(c) Adjust the inlet louvres on the upper duct for maximum air. (See Figure 2-4).

CABIN EXPEDITOR 3TM

48 To obtain maximum heat in the cabin adopt the procedure for 3N, 3NM and 3T aircraft. Then:

(a) Adjust the inlet hot air louvre (near the floor for maximum flow). (See Figure 2-4).

(b) The procedure to obtain maximum cold air is the same as that adopted on 3N, 3NM aircraft.

(c) Intermediate positioning of the hot and cold controls varies the mixture of hot and cold and hence varies the temperature.

LANDING PROCEDURES

BEFORE ENTERING TRAFFIC PATTERN

49 Prior to entering traffic pattern (see Figure 2-5, Landing Pattern Diagram):

(a) Set engine to 20 inches manifold pressure at cruising rpm to give approximate airspeed of 105 knots.

(b) Ensure that all passenger seat belts are fastened.

TRAFFIC PATTERN CHECK LIST

50 At "INITIAL" (i.e. half way along down wind leg) carry out the following checks:

(a)	F	Fuel	Select " FRONT " tanks. Check contents.
(b)	B	Brakes	Check operation.
(c)	U	Undercarriage	Select "DOWN" (Not above 110 knots IAS). Check green light 'on'. Check visually.

Part 2, HANDLING, page 59, para. 52, Final Approach.

Original paragraph to be numbered (a).

Add new para. (b)

(b) Techniques for night landings are the same as for day, except that it is recommended that landing lishts be used. Under conditions of restricted visibility such as haze, fog, snow or rain, when the pilot is of the opinion that the use of landing lights is a hindrance, rather than an aid to visibility, landing lights will be used at the pilot's discretion.

(d)	M Mixture	"RICH" (fully forward)
	Manifold heat	As required.
(e)	P Power	Increase manifold pressure to 25 inches to counteract drag when undercarriage extends.
(f)	H Harness	Crew securely strapped in.

BASE LEG

51 Turn on to base leg and perform the following action:

(a)	Flaps	As required (not above 100 knots).

FINAL APPROACH

52 (a) Select flap as required. Reduce speed to cross the button at 85 knots IAS. Move pitch into full fine before touch-down. Carry out a tail down, wheel landing and allow the tail to lower slowly during landing run. Gentle application of brake may be necessary to maintain directional control as rudder control is limited at low speeds.

(b) see yellow revision

NOTE

The lavatory compartment on all aircraft, and the navigator instructors collapsible seat on types 3N and 3NM, must not be occupied during landing.

CROSS-WIND LANDING

53 The final approach is made at increased airspeed, with little or no flap in severe cross-wind conditions. Considerable aileron may be required, with opposite rudder to counteract drift. The aircraft is flown on to the runway, elevator pressure used to hold the

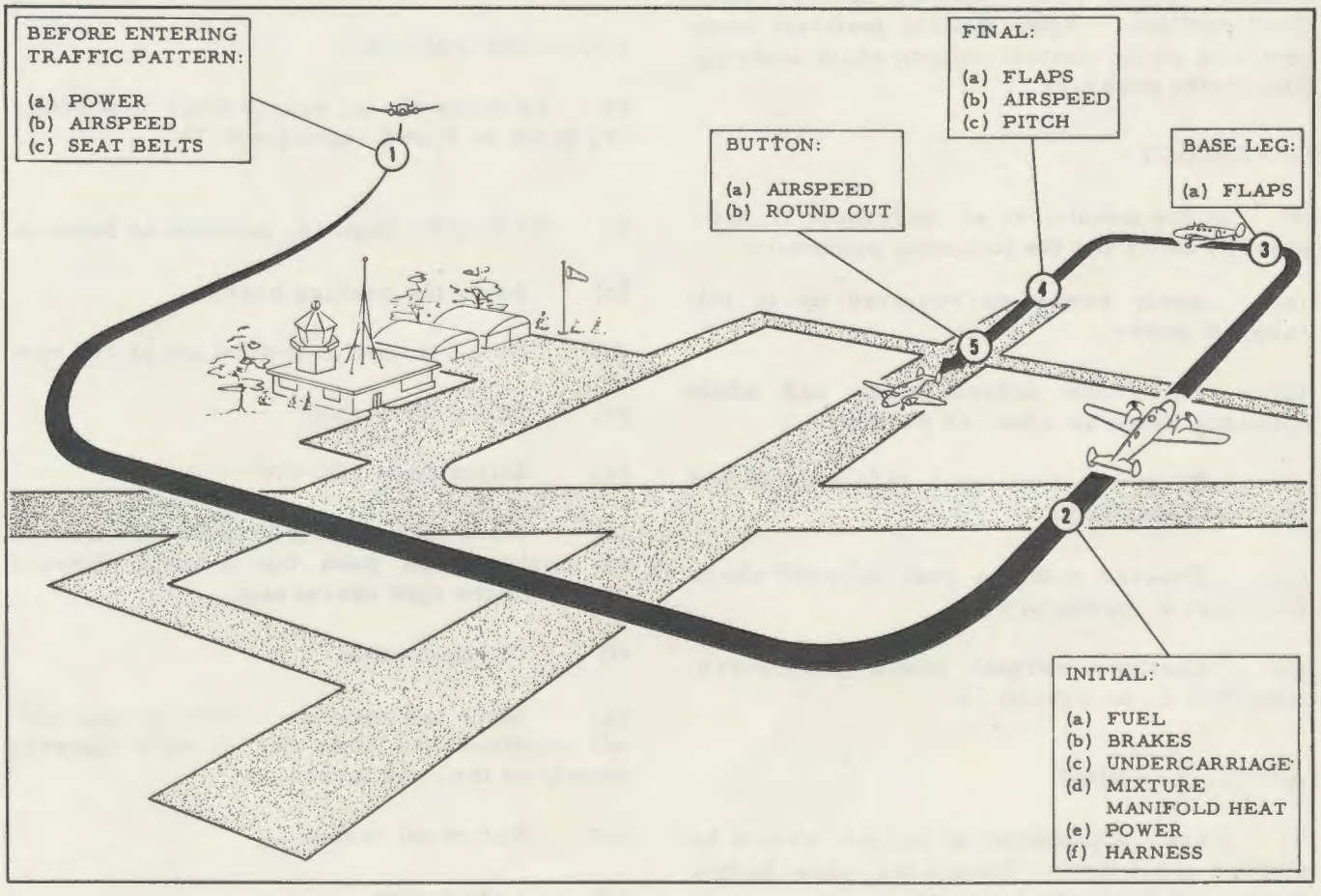


Figure 2-5 Landing Pattern Diagram

aircraft down, and direction maintained with rudder and throttle. Into-wind aileron is held throughout the landing roll. Directional control maintained with rudder, brake and throttle if necessary.

54 Cross-wind landings are not to be attempted when the cross-wind component exceeds 15 mph at 90°. (See Figure 2-3, Cross-wind Component Graph and NOTE Part 2 paragraph 21).

MINIMUM RUN LANDING

55 To carry out a minimum run, or precautionary landing, increase rpm to 2000 before reducing the manifold pressure for the descent on base leg. Lower flap earlier than normal on final approach, and maintain airspeed at 80 to 85 knots IAS. Reduce the airspeed late in the approach to cross the button at 70 to 75 knots, and close throttles over the button. Place pitch controls in the "fully fine" position. After landing maintain back pressure on the control column while applying firm brake pressure.

OVERSHOOT

57 In the event that an overshoot is necessary, carry out the following procedure:

(a) Apply power as required up to full take-off power.

(b) Raise the undercarriage and attain climbing speed as soon as possible.

(c) Raise the flaps at a safe altitude and trim as necessary.

(d) Proceed with the post take-off check (See Part 2, paragraph 22).

(e) Continue normal climb procedures. (See Part 2, paragraph 23).

AFTER LANDING

57 Harsh application of brakes should be avoided at all times. Unlock tail wheel before turning off the landing runway.

POST-LANDING CHECK

58 Taxi well clear of the runway in use, stop the aircraft, apply the parking brakes and carry out the following checks:

(a)	Flaps	Select "UP"
(b)	Gills	All shutters "open"
(c)	Pitch	Check in "fine" position
(d)	Switches	All unnecessary switches "off" (Check pitot heat "off")
(e)	Radios	All unnecessary radios "off"

END OF FLIGHT PROCEDURE

STOPPING ENGINES

59 To dilute the oil supply refer to procedure given in Part 2, paragraph 76.

60 To stop the engines - proceed as follows:

(a) Apply the parking brake.

(b) Check magnetos ground out at 700 rpm

(c) Idle at 1000 rpm

(d) Select flaps "DOWN"

(e) Move right mixture control to idle cut-off position and push the throttle forward slowly as the rpm decreases.

(f) Check suction

(g) Move left mixture control to idle cut-off position and push the throttle forward slowly as the rpm decreases.

(h) Switch off radios

(j) Cage gyros

(k) Turn "off" all switches

(m) Fuel tank selectors - "OFF"

BEFORE LEAVING AIRCRAFT

61 Prior to leaving the aircraft, proceed as follows:

(a) Fit the control lock, stowed on the pilot's floor. (See Figure 1-8).

(b) Close the cabin door.

(c) Ensure pitot covers are on.

(d) Check that wheel chocks are in position.

PICKETING THE AIRCRAFT

62 Tie-down lugs are provided on the underside of each wing. For tail picketing, loop rope through tail-wheel strut. The towing lugs on the inboard side of the landing gear strut near the hub also can be used for picketing. If high winds are expected, the best additional picket is to loop a rope over the propeller hub or engine shaft and secure the other end directly below and a little forward of the propeller. Always lock tail wheel and, if possible, chock wheels.

COLD WEATHER OPERATION

BEFORE ENTERING THE AIRCRAFT

63 Prior to entering the aircraft perform the checks listed in paragraph 7 this Part, (See Figure 2-1). In addition check that:

(a) The following vents are free from ice:

(1) The engine breather (inboard of each power plant).

(2) De-icer oil separator (on inboard side of nacelle).

(3) Wing fuel tank (beneath centre section of each wing).

(4) Nose fuel tank (beneath nose, rear of access door).

(5) Generator control box (3T, beneath the cockpit side windows 3N, 3NM and 3TM; on inboard side of nacelles).

(6) Tail cone drain (beneath tail cone).

NOTE

If the drain is stopped up, water may collect inside the cone. As the temperature drops, this water will freeze, restricting or even blocking elevator travel. Check that the strip between the movable and fixed parts of the tail cone has been moistened with low temperature lubricating grease. When this felt strip gets wet and then freezes, it holds the elevator in one position. This situation is not dangerous but the elevator will tend to stick in any position to which it is moved, and smoothness of control is lost.

(b) Each propeller is pulled through five complete revolutions by hand.

AFTER ENTERING AIRCRAFT

64 Carry out the procedure given in Part 2 paragraph 9, then push cockpit heating control on pedestal to 'hot'. Select floor controls in cockpit (3TM, 3N and 3NM) to "HOT". Turn the cockpit louvres to face aft. This allows maximum flow of air to the windshields, cold at first, then becoming warm as the intensifiers warm up, after the engines start.

STARTING ENGINES

65 Start the engines as follows:

(a) Start the engines in accordance with procedure given in Part 2, paragraph 11 and 12, utilizing the modified selections below.

(b) Prime the engines immediately before engaging the starter, in accordance with Part 2 paragraph 11 (c). While the engine is turning over by the starter actions, prime intermittently until the engine fires regularly.

NOTE

Moisture forms quickly on the spark plugs during cold starting, causing irregular firing. If the engine will not respond when the throttle is advanced, run the engine at 400 to 600 rpm for two or three minutes using primed fuel only as required to keep the engine running. With care, partial manifold heat may be used during this period.

(c) Maintain the cowl flaps open during all ground operations, to prevent overheating of the engine accessories.

(d) Repeat (a) to (c) above for the other engine.

WARMING UP

66 To warm up the engines, proceed as follows:

(a) Do not run engines at more than 1000 rpm until the oil temperature reaches 40°C. When the oil temperature has reached 40°C, move the oil by-pass valve slowly to the cold position. At this point an oil temperature drop should be observed if coring is not present. Oil pressure should remain within limits at all times. In extreme cold, the automatic by-pass function of the valve may not operate properly, though normally when the oil reaches 20°C, the by-pass valve will be warmed sufficiently to allow oil to by-pass the radiator automatically if the radiator is blocked by congealed oil.

NOTE

When the OAT is low maintain the oil temperature near the upper limit to prevent clogging in the radiator.

(b) Use manifold heat as required to improve vaporization and prevent backfiring.

(c) When subjected to excessive drain, storage batteries deteriorate rapidly in cold weather; therefore, no electrical equipment should be used until generators are supplying current. When the generators are operating the red failure warning lights go out.

TAXIING

67 The general instructions on taxiing under cold weather conditions contained in EO 05-1-1, Pilot's Operating Instructions, General, apply to the Expeditor.

ENGINE AND ACCESSORY CHECK

68 Carry out the normal engine accessory check with the following addition. Operate the propeller through at least three complete cycles of pitch range. (See Part 2, paragraph 18).

TAKE OFF

69 Proceed as follows:

(a) See paragraph 18 "Pre - Take - off Check".

(b) See EO 05-1-1, Pilot's Operating Instructions, General.

(c) A manifold heat temperature +5°C to +10°C, at take-off power, may be used during take-off in conditions of extreme cold, to prevent the carburettor heat valve from freezing in the cold position.

AFTER TAKE-OFF, CLIMB AND DURING FLIGHT

70 See EO 05-1-1. Use sufficient manifold heat to prevent rough operation and backfiring.

71 Set manifold heat levers to maintain a carburettor mixture temperature between +5°C and +10°C at all times during flight. Manifold heat is effective as an ice preventative, hence should be used continuously to prevent ice rather than periodically to remove it. In severe icing conditions frequently move the throttle levers so that they will not become frozen in any one position.

72 About every half hour exercise propeller levers through full range to flush cold oil from propeller hubs. Maintain oil temperature near upper limits, if possible, to provide better governing.

DESCENT AND LANDING

73 Refer to EO 05-1-1, Pilots' Operating Instructions, General.

74 When reducing rpm watch engine temperatures closely. Keep cylinder head temperatures above 100°C by maintaining sufficient power, adding manifold heat and closing cowl flaps. This will assure good fuel vaporization, thus minimizing the danger of backfiring and cutting-out. Oil temperature should be maintained above 40°C at all times during flight.

WARNING

Do not fail to use sufficient manifold heat during approach and landing. Be prepared to change manifold heat to "COLD" (up) to obtain maximum power if landing cannot be completed.

75 Maintain the manifold heat control in "hot" (down) position while taxiing.

STOPPING THE ENGINES

76 When stopping the engines carry out the following procedure:

(a) If a cold weather start is anticipated, dilute engine oil in accordance with the following procedure:

(1) Allow engines to cool until oil temperature falls below 40°C. It may be necessary to stop engines to cool and re-start.

(2) Idle at 1000 to 1200 rpm.

(3) Maintain oil temperature below 50°C and oil pressure above 15 psi.

(4) Hold dilution switches for length of time indicated for temperature expected. (See Table 2-2, Oil Dilution).

NOTE

If temperature tends to exceed 50°C during dilution, stop engine and permit oil to cool well below 40°C, then restart and continue dilution procedure. The total of the two or more dilution periods should equal the time shown in Table 2-2.

(b) If starting is expected at temperatures near freezing or below, place oil by-pass in "PULL-HOT" after oil dilution is accomplished. At next start leave in this position for starting and initial run-up until oil temperature reaches 40°C.

NOTE

This procedure is important. Extreme oil pressures during starting are caused by the congealed state of the oil. These pressures can rupture the oil radiator if the oil by-pass is closed. For this reason, oil by-pass valves should be placed in "PULL-HOT" position when the engines are shut down if a cold start is anticipated.

(c) To Avoid Over Dilution - An engine running period of approximately 60 minutes is necessary before further oil dilution is carried out.

(d) Stop the engines in accordance with Part 2, paragraph 60. Normal Stopping Procedure.

BEFORE LEAVING THE AIRCRAFT

77 Carry out the checks given in paragraph 61, "END OF FLIGHT PROCEDURE, Before Leaving Aircraft".

OIL DILUTION REQUIREMENTS	
ANTICIPATED NEXT START TEMP.	DILUTION PERIOD
4°C to -12°C	1-1/2 minutes
-12°C to -29°C	3 minutes
-29°C to -46°C	5 minutes
(add one minute of dilution for each additional 5°C, below -46°C)	

Table 2-2 Oil Dilution

PART 3

EMERGENCY HANDLING

INTRODUCTION

1 The purpose of this part is to augment emergency handling actions, contained in EO 05-1-1, Pilot's Operating Instructions, General. The actions given are to remedy all anticipated flying hazards, applicable to Expeditor 3 aircraft, and include single engine flight under specific conditions, fire extinguishing procedures, complete instructions for crash landing, ditching and abandoning the aircraft in flight, together with emergency operation of essential aircraft systems.

ENGINE FAILURE

FLIGHT CHARACTERISTICS UNDER PARTIAL POWER CONDITIONS

2 With one engine dead, the aircraft can be trimmed to fly hands and feet off, down to a minimum speed of 90 knots IAS. For details of immediate and subsequent action, refer to EO 05-1-1, Pilot's Operating Instructions, General. Under conditions of single engine flight, the operating engine automatically maintains suction to operate instruments, and pressure to actuate de-icer boots.

ENGINE FAILURE UNDER SPECIFIC CONDITIONS

ENGINE FAILURE BEFORE BECOMING AIRBORNE

3 If an engine fails before the aircraft leaves the ground carry out the following procedure:

(a) Throttle back immediately and bring aircraft to a stop using careful application of brakes.

(b) Mixture - to Idle Cut-off.

(c) Switches - "OFF"

(d) Fuel - Tank selectors to "OFF".

(e) If it is apparent that the aircraft will overshoot the landing area, prepare to collapse the undercarriage and/or ground loop is necessary to prevent collision with obstacles ahead.

ENGINE FAILURE DURING TAKE-OFF BELOW SAFETY SPEED

4 In the event of engine failure before safety speed has been reached proceed as follows:

(a) If it is apparent that continuing the take off is impossible, land straight ahead, with undercarriage up or down depending upon whether it is possible to complete a normal landing or necessary to land wheels up.

(b) Proceed as in 3 (b) to (e) above.

ENGINE FAILURE DURING TAKE-OFF - SAFETY SPEED ATTAINED

5 In the event of engine failure after safety speed has been reached, carry out the following procedure:

(a) Control - Maintain directional control, adjust attitude to achieve 95 knots.

(b) Power - Apply maximum take-off power to the live engine.

(c) Drag Check - Check undercarriage and flaps "UP". Close throttle of dead engine and feather. Check cowl gills of dead engine closed and retrim aircraft.

(d) Maintain take-off power as long as necessary, but cylinder head temperature must not be allowed to exceed 232°C.

(e) For subsequent action see EO 05-1-1.

NOTE

Climb performance at take-off power and 9300 lbs. AUW with propeller feathered will vary from about 100 ft/min. on a hot day to 200 feet/min, on a sub-zero day, up to a rated altitude of 2,500 feet. With propeller windmilling in fine pitch, the climb performance is marginal and even at take-off power the aircraft will probably lose height if the air temperature is above ICAN standard.

ENGINE FAILURE DURING FLIGHT

6 In the event of engine failure during flight, carry out the following procedure:

(a) Control - Maintain directional control and adjust attitude to maintain 110 knots.

(b) Power - Apply "maximum continuous" to live engine (33-1/2 inches manifold pressure and 2200 rpm).

(c) Drag Check - Close throttle of "dead" engine. Check undercarriage and flaps "UP".

(d) Check cause of engine failure as follows:

(1) G Fuel - Check pressure.

(2) M Mixture - to "RICH"
Manifold Heat - Both hot

(3) S Switches - Check

NOTE

If, during the above drill of vital actions, the control of the aircraft is threatened, immediately apply trim to maintain control.

WARNING

Apply manifold heat SLOWLY to prevent the live engine from cutting out.

(e) If the cause of failure is not found, or the situation cannot be rectified, feather the dead engine:

(1) Feather - Depress feathering button.

(2) Mixture - Idle cut-off.

(3) Fuel - "OFF" on dead engine side when propeller stops rotating.

(4) Switches - Ignition "OFF".

(5) Generator - "OFF".

(6) Anti-icer - Propeller Anti-icer "OFF".

CAUTION

Anti-icing fluid in its liquid form represents a fire hazard. If an engine is inoperative de-icer fluid can flow to the collector ring and then overflow into the engine, or down the lower blade of the propeller. If there is a possibility of engine fire re-igniting DO NOT operate anti-icer under these conditions. If the engine is inoperative due to circumstances other than fire, anti-icing for the operating propeller may be used with caution.

(7) Re-trim the aircraft, and adjust all controls for asymmetric flight. The recommended single-engine speed for maximum range is 110 knots IAS. To determine the best economical control settings depending on the weight of the aircraft, range required, altitude, and remaining fuel, refer to Figure 4-7.

MAXIMUM GLIDE

7 The procedure to establish the maximum glide path is as follows:

(a) Flaps - "UP".

(b) Establish best glide speed, i.e. 95 knots IAS.

(c) Trim the aircraft to maintain optimum glide speed.

LANDING WITH ONE ENGINE INOPERATIVE

8 Carry out a normal approach and landing but:

(a) Do not lower the undercarriage until it is certain the landing field will be reached.

(b) Do not select flaps down until it is certain the landing field will be reached.

(c) Carry out final approach at 95 knots and aim to cross the button at 85 knots IAS.

GO-AROUND WITH ONE ENGINE INOPERATIVE

9 If it is found necessary to go around again:

(a) Apply full take-off power to the live engine.

(b) Check the descent and maintain single engine safety speed.

(c) Raise the undercarriage.

(d) Initiate climb at 95 knots.

(e) Reduce power for climb as soon as possible and check temperatures and pressures on live engine.

(f) Adjust cowl flaps as necessary.

PROPELLER FAILURE

10 On Expeditor aircraft engine speed is governed by variable pitch, fully-feathering propellers. The propellers have a very large pitch range, the pitch being varied by engine oil pressure, and governor oil pressure. For complete details concerning the various types of propeller failure, refer to EO 05-1-1, Pilot's Operating Instructions, General.

RUNAWAY PROPELLER

11 In the event of a runaway propeller in flight, carry out the following procedure:

(a) Initiate a turn up and away from the affected propeller, until rpm is brought under control.

(b) Close throttle of affected engine.

(c) Feather affected propeller.

(d) After the propeller has feathered shut the engine down.

(e) If the propeller will not feather, reduce airspeed and altitude as much as safety permits to keep the rpm below the maximum continuous allowable limits (2200 rpm).

FIRE

ENGINE FIRE

12 To extinguish an engine fire on the ground, carry out the following procedure:

(a) Throttle - Closed

(b) Mixture - Idle cut-off

(c) Fuel - "OFF"

(d) Switches - "OFF"

(e) Fight fire with ground apparatus. If necessary use the engine fire extinguisher. Shut down other engine if running. Evacuate the aircraft.

ENGINE FIRE IN FLIGHT

13 To extinguish an engine fire in flight, carry out the following procedure:

(a) Throttle - Closed

(b) Propeller - Feather

(c) Mixture - Idle Cut-off

(d) Fuel - "OFF"

(e) Oil Shut-off valve - Closed (There is no oil shut-off valve in the 3T).

(f) Cowl flaps - Closed

(g) Fire extinguisher - Select. Discharge when propeller stops rotating.

(h) Magnetos - "OFF"

(j) Propeller anti-icer off.

(k) Set aircraft up for asymmetric flight.

FUSELAGE FIRE (OTHER THAN ELECTRICAL)

14 Use the hand fire extinguishers located in the fuselage. Carry out the extinguisher operating instructions on the bottles. i.e. Raise the handle to break the wire locking seal - squeeze the plunger actuating lever: Direct the fluid to the base of the fire. (See Part 3 paragraph 16 for means of dissipating smoke and fumes).

ELECTRICAL FIRE

15 Eliminate the cause of the fire by turning off the offending power supply. Then extinguish the fire according to paragraph 14 above. The extinguishing agent in hand fire extinguishers is safe for electrical fires. If the offending power supply cannot immediately be located, carry out the following procedure:

(a) Battery master and generator switches - "OFF".

(b) All electrical and radio equipment - "OFF".

(c) Battery masters and generator switches - "on".

(d) Re-select services one at a time until the offending power supply is located.

(e) Use extinguisher as necessary.

SMOKE ELIMINATION

16 To eliminate smoke and toxic fumes after the fire is completely extinguished, open the side windows and both cockpit and cabin cold air supplies. Open the exhaust grills in roof.

EMERGENCY LANDING

17 In the event of a forced landing on land, the pilot must decide whether to land with the landing gear extended or retracted. If in doubt land with the gear retracted. Prior to landing make the following selections:

(a)	Fuel Tank Selectors	"OFF"
(b)	Master Ignition Switch Throwbar	"OFF"
(c)	Wing Flaps	"DOWN"
(d)	Undercarriage	As decided
(e)	Battery and Generator Switches	"OFF"

NOTE

If the landing must be made because of low fuel supply, it is advisable to land before the fuel is completely exhausted so that power will be available. Escape can be made from the aircraft through either the cabin door, the emergency escape hatch and, in 3N and 3NM types, through the astrodome. See Part 1, paragraphs 114, 115 and 116 for details of release of these exits.

CAUTION

Do not jettison cabin door in flight, unless the aircraft is to be abandoned in flight, as it will damage the empennage. It is recommended that the cabin door be unlatched prior to forced landing.

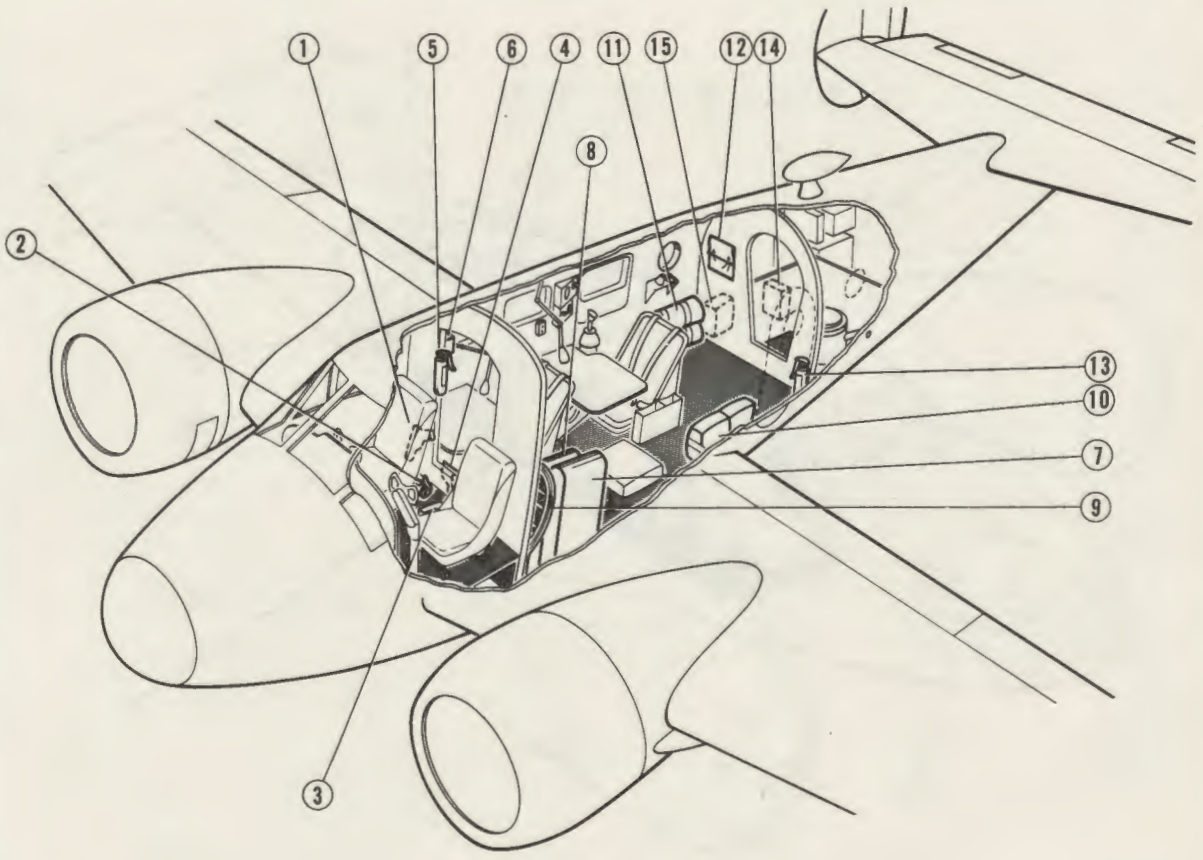
For complete details of emergency landing together with the duties of all personnel, refer to EO 05-1-1, Pilot's Operating Instructions, General, Unit Orders and Figures 3-1 and 3-2 (for location of emergency equipment). Typical emergency landing drills are shown in Table 3-1.

EMERGENCY ENTRANCE

18 When entrance cannot be made through the cabin door, emergency forced entry is accomplished from the right hand side of the fuselage. Two areas marked on the skin indicate the position through which an access can be made.

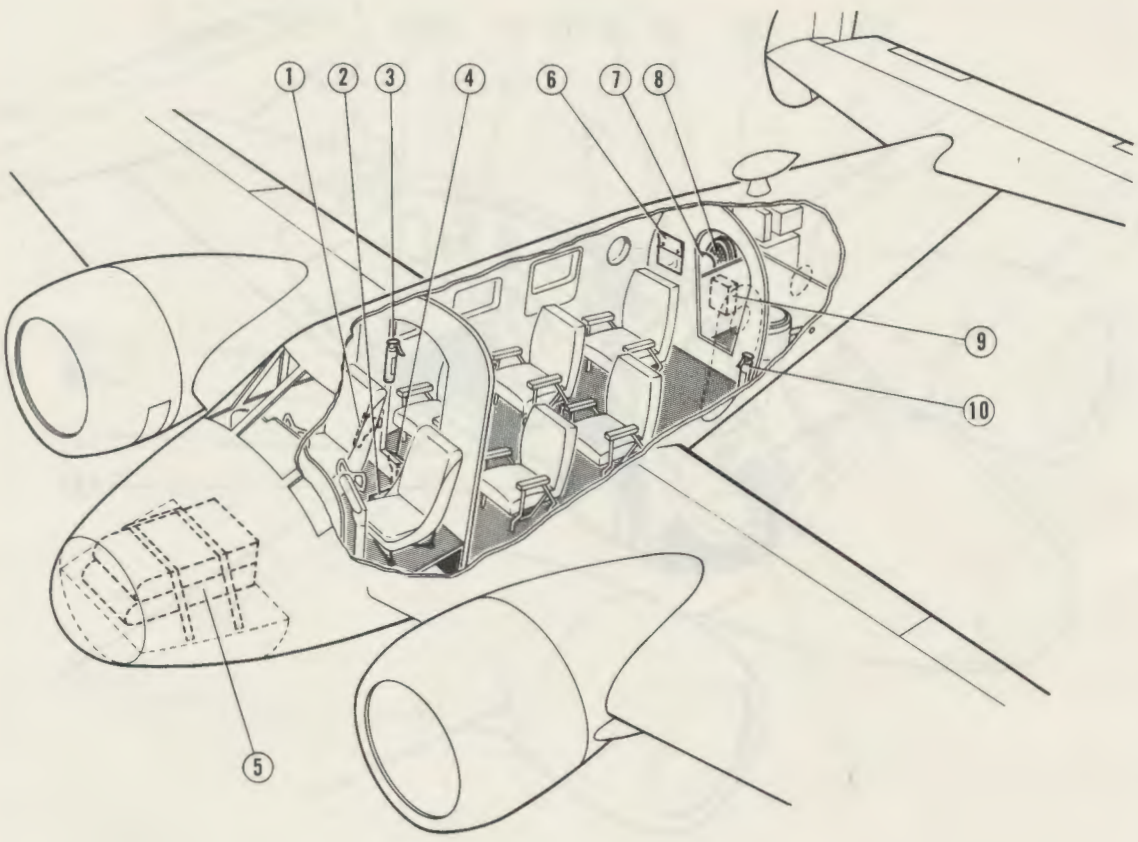
DITCHING

19 For complete details of ditching instructions, together with the appropriate responsibilities and duties to be carried out by all personnel, refer to EO 05-1-1, Pilot's Operat-



1 Signal Pistol
2 Fire Extinguisher (3T only)
3 Signal Pistol Cartridge Box (3N, 3NM only)
4 Crash Axe
5 Fire Extinguisher (3N, 3NM)
6 Signal Pistol Cartridge Box (3T only)
7 Survival Kit & Toboggan
8 Parachute
9 Snowshoes
10 Parachutes
11 Sleeping Bags
12 Forced Landing Instructions and Emergency Maps
13 Fire Extinguisher
14 First Aid Kit
15 Parachute

Figure 3-1 Typical Arrangement of Emergency Equipment Stowage (3N, 3NM, 3T)



1 Signal Pistol
2 Signal Pistol Cartridges
3 Fire Extinguisher (3N, 3NM and 3TM)
4 Crash Axe
5 Survival Kit and Toboggan
6 Forced Landing Instructions and Emergency Maps
7 Sleeping Bags
8 Snowshoes
9 First Aid Kit
10 Fire Extinguisher

Figure 3-2 Typical Arrangement of Emergency Equipment Stowage (3TM)

ing Instructions, General, Unit Orders and Table 3-3 for typical abandoning drill.

ABANDONING IN FLIGHT

20. For complete details of abandoning aircraft procedures refer to EO 05-1-1, Pilot's Operating Instructions, General, Unit Orders and Table 3-3 for typical abandoning drill.

(a) Decrease IAS to 90 knots.

(b) Jettison the cabin door.

(c) Maintain level flight until all occupants have left the aircraft.

(d) Head the aircraft towards an uninhabited area.

(e) Trim aircraft slightly nose down for straight flight.

(f) Adjust parachute. Kneel on the cabin floor facing the doorway. Roll out head first, turning a somersault.

WARNING

Do not jump or you may not clear the tail surfaces. Do not bail out from either the emergency hatch or the astrodome as this could result in personal injury.

EMERGENCY OPERATION OF LANDING GEAR

21 If landing gear does not operate electrically:

(a) Reset the circuit breaker by pushing down on the red reset button located under the pilot's seat, (Figure 3-4) and the circuit breaker located on left sub-panel.

(b) Check generators "on" and operating.

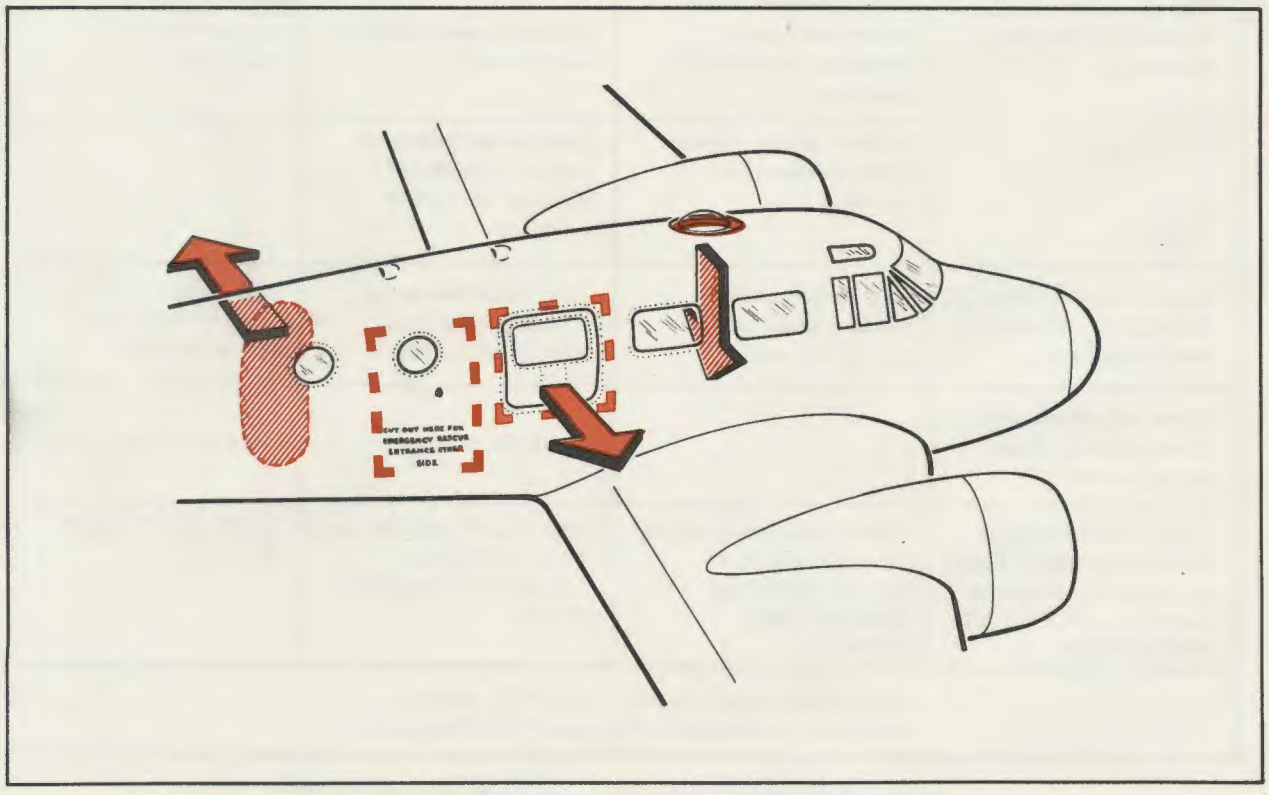


Figure 3-3 Emergency Exits and Entrance

(c) Try lowering landing gear again electrically.

(d) If gear does not go down, pull out landing gear circuit breaker located on left subpanel.

(e) Raise landing-gear clutch-pedal cover and depress clutch, (Figure 3-6). The gear will drop to a trailing position.

WARNING

Do not lower landing gear at speeds greater than 110 knots IAS.

(f) Keep pedal depressed and engage landing gear - wing flap crank by pulling inboard (away from pilot). Lower gear by cranking so that crank moves forward at the top of the stroke. (See Figure 3-5).

NOTE

The same crank is used to lower wing flaps manually. The crank must be pulled inboard (away from pilot) in order to operate the landing gear. By releasing the clutch pedal, the gear may be held in any position during manual operation.

(g) When crank cannot be turned further, release the clutch pedal, remove the inspection panel between the pilots' seats and check visually to see that the clutch teeth on the

CAPTAIN	FIRST NAVIGATOR	SECOND NAVIGATOR	CO-PILOT, SCREEN OR CREWMAN
"PREPARE FOR CRASH LANDING"	Acknowledge order and inform others	Acknowledge order and inform others	Acknowledge order and inform others
Check safety harness Transmit distress message	Help Captain with safety harness Jettison astrodome (inwards)	Jettison emergency exit panel	Secure safety harness over shoulders
Check exits jettisoned, crew and equipment secure	Secure loose equip. Fasten shoulder harness	Secure or jettison loose equipment Fasten shoulder harness	
Warn Crew -"BRACE BRACE" Protect head with arm	Use both hands to brace; hold until a/c is at rest	Use both hands to brace; hold until a/c is at rest	Use both hands to brace; hold until a/c is at rest
When aircraft stops operate port fire extinguisher		Jettison main door	Help pilot get free
Take Verey Pistol and cartridges. Hand emergency maps to 1st Nav. LEAVE BY MAIN DOOR	Take maps and leave by main door. NB IN WINTER TAKE OTHER KITBAG	Take first aid kit and ONE KITBAG - LEAVE BY MAIN DOOR	LEAVE BY MAIN DOOR
Navigators shall assist pilot with position for distress message if time and training permit.			

Table 3-1 Typical Crash Landing Drill (3N, 3NM)

CAPTAIN	FIRST NAVIGATOR	SECOND NAVIGATOR	CO-PILOT, SCREEN OR CREWMAN
"PREPARE FOR DITCHING"	Acknowledge order and inform others	Acknowledge order and inform others	Acknowledge order and inform others
Check safety harness. Transmit distress message	Help Captain with shoulder harness		Remove parachute harness
Partially inflate Mae West	Jettison Astro Dome (inwards)	Jettison emergency exit panel	Partially inflate Mae West
Check: exits jettisoned, crew and equipment secure. Keep crew advised of the situation	Remove parachute harness and partially inflate Mae West. Fasten shoulder harness	Remove parachute harness, partially inflate Mae West. Fasten shoulder harness	Fasten shoulder harness
Just before impact warn crew "BRACE-BRACE". Protect head with arm	At command, use both hands to brace - wait for second impact	At command, use both hands to brace - wait for second impact	At command, use both hands to brace - wait for second impact
After second impact operate port fire extinguisher		Jettison main door as aircraft slows down	Move to rear
NO DINGHY			
Take Verey Pistol and cartridges. Hand emergency maps to 1st Nav. Enter the water. Inflate Mae West fully	Pass first aid kit and Nav bag to 2nd Nav. Enter the water. Inflate Mae West fully	Enter the water. Receive first aid kit and Nav bag from 1st Nav. Inflate Mae West fully	Enter the water. Inflate Mae West fully
DINGHY CARRIED			
Take Verey Pistol and cartridges. Hand emergency maps to 1st Nav	Pass first aid kit and Nav bag to 2nd Nav.	Secure static line and launch dinghy	Help 2nd Nav to launch dinghy
Board dinghy CUT STATIC LINE	Board dinghy CUT STATIC LINE	Board dinghy. Receive first aid kit and Nav bag from 1st Nav. CUT STATIC LINE	Board dinghy CUT STATIC LINE
Navigators shall assist pilot with position for distress message if time and training permit.			

Table 3-2 Typical Ditching Drill (3N, 3NM)

cross shaft are fully engaged. If necessary, move the hand crank back slightly until the clutch pedal comes back against the floor boards. (Figures 3-5, 3-6, 3-7 and 3-8).

WARNING

To lower the gear manually, always depress the clutch and allow the wheels to drop free before attempting to engage the hand crank. If the hand crank is engaged prior to depressing the clutch, the entire weight of the gear must be supported by the hand crank after the clutch is depressed. It is very difficult to maintain control of the hand crank under these conditions, and if the crank slips out of the operator's hand, the weight of the wheels will cause it to spin rapidly, resulting in probable injury to the operator.

(h) Check wheels down and locked visually. When landing gear is fully extended, the forward part of the left wheel can be seen from the pilot's compartment.

CAPTAIN	FIRST NAVIGATOR	SECOND NAVIGATOR	CO-PILOT, SCREEN OR CREWMAN
"PREPARE TO ABANDON AIRCRAFT"	Acknowledge order and inform others	Acknowledge order and inform others	Acknowledge order and inform others
Transmit distress message	Put on parachute	Put on parachute	Put on parachute
Give order, - "Jettison Door"		Go to rear Stay on intercom Jettison door and acknowledge	
Leave seat. Put on parachute. Give order - "Eject - Eject"	Leave after second Nav.	Acknowledge order, remove headset, leave after co-pilot	Go to main door; leave first.

NB (1) Bail out through main doorway only.

(2) Do not jettison door until ordered to do so by captain

(3) DO NOT JUMP OUT - kneel in doorway and roll forward.

(4) The Emergency Order is:

"EMERGENCY, ABANDON AIRCRAFT, JUMP - JUMP"

Table 3-3 Typical Abandoning Aircraft Drill (3N, 3NM)

Figure 3-4 Landing Gear Circuit Breaker

EMERGENCY OPERATION OF WING FLAPS

22 Wing flaps may be lowered manually with the landing-gear wing-flap hand crank located at the right side of the pilot's seat.

Figure 3-5 Landing Gear/Wing Flap Hand Crank

(See Figure 3-5). If flaps will not operate electrically.

(a) Place flap switch in "OFF" (centre) position.

(b) Push crank in (toward pilot).

(c) To lower wing flaps, turn crank so that crank handle moves forward at top of rotation. Turn crank in opposite direction to raise flaps. Approximately 30 turns are required for full deflection.

Figure 3-6 Landing Gear Clutch Pedal

WARNING

Do not lower wing flaps when IAS exceeds 100 knots.

ELECTRICAL FAILURE

23 Proceed as follows:

(a) Check to see if generator switches are on

(b) If generator failure light is on, turn off switch of failed generator and reduce electrical load to less than 100 amps.

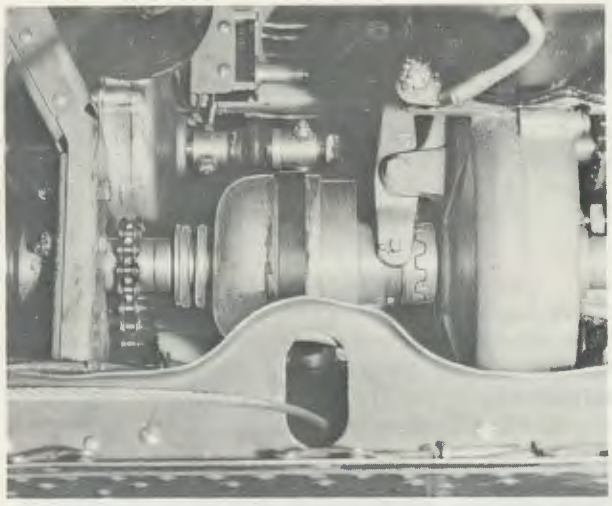


Figure 3-7 Landing Gear Clutch, Teeth Engaged

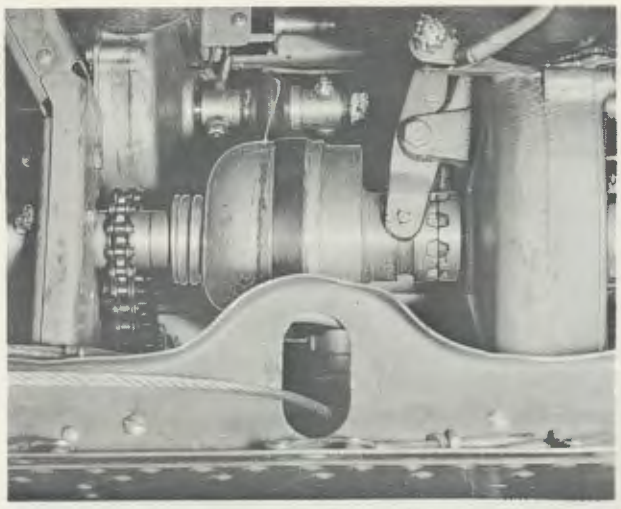


Figure 3-8 Landing Gear Clutch, Teeth Disengaged

(c) If both generators fail as indicated by failure lights, turn off as much electrical load as practicable to conserve battery power.

(d) If ammeter reads zero but generator light is not on, turn off large electrical loads, e.g. propeller feathering, wait one minute, then reset generator circuit breaker, see Figures 1-13 and 1-14.

MISCELLANEOUS EMERGENCY EQUIPMENT

24 For location of first-aid kits, hand fire extinguisher, and parachute stowage, refer to Figure 3-1.

PART 4

OPERATING DATA

INTRODUCTION

1 This part contains all operating data necessary for pre-flight, in-flight and landing planning. Limiting conditions are listed for both the power plants and the airframe. Instruments that indicate an operating range or limit are illustrated. A sample problem is included to illustrate use of five basic charts

ENGINE RESTRICTIONS

MAXIMUM OVERSPEED

2 The maximum permissible rpm is 2350. Cowl flaps must be closed throughout the diving manoeuvre. (See Note Part 2 paragraph 42).

MAXIMUM TAKE-OFF POWER

3 Limited to one minute duration for two engine operation, but as long as necessary in case of single engine emergency.

(a)	Engine speed	2300 rpm
(b)	Manifold pressure	36 in. Hg
(c)	Cylinder Head Temperature	260°C
(d)	Cylinder Head Temperature for extended emergency operation.	232°C
(e)	Mixture	Fully rich

4 MAXIMUM CONTINUOUS POWER

(a)	Engine speed	2200 rpm
(b)	Manifold pressure	33.5 in. Hg
(c)	Cylinder Head Temperature	232°C
(d)	Mixture	Fully rich

THROTTLE AND PROPELLER CONTROLS

5 Avoid violent changes of the throttle and propeller controls to prevent the engines over-speeding.

6 The normal fuel grade to be used is 80/87. Limited use may be made of 91/98; 100/135 grades. In an emergency 115/145 grade fuel can be used. Power restrictions for limited and emergency fuel are: Operate at 1900 rpm or higher at 280-296 BHP. For all restrictions on the use of limited and emergency rated fuels see EO 45-1-2.

FLIGHT RESTRICTIONS

7 AIRSPEED LIMITATIONS

(a)	Maximum speed (smooth air)	220 knots IAS
(b)	Maximum speed (rough air)	175 knots IAS
(c)	Maximum speed lowering flaps	100 knots IAS
(d)	Maximum speed for lowering landing gear	110 knots IAS
(e)	Maximum speed for lowering landing lights	95 knots IAS
(f)	Maximum speed for landing lights extended	105 knots IAS

8 RECOMMENDED SPEEDS

(a)	Normal climb	105 knots IAS
(b)	Maximum glide	95 knots IAS
(c)	Maximum range	125 knots IAS
(d)	Maximum endurance	95 knots IAS

9 SINGLE ENGINE SPEEDS

(a)	Safety speed	80 knots IAS

(b)	Minimum trim	90 knots IAS
(c)	Recommended rate of climb	95 knots IAS
(d)	Maximum range	110 knots IAS

NOTE

Single engine flight performance based on flight with one propeller feathered, and critical engine (right) operating.

PROHIBITED MANOEUVRES

10 All aerobatic manoeuvres, such as spins, rolls, loops and inverted flight, are prohibited.

INSTRUMENTS

11 Figure 4-1, Instrument Markings, illustrates the engine instruments, with their operating ranges. The range calibrations have been determined for use with 80/87 grade fuel.

WEIGHT AND BALANCE DATA

12 The maximum permissible gross weight of the aircraft is 9300 pounds for take-off and 9000 pounds for landing. The centre of gravity range, with the landing gear extended, is 109.8 inches (18.9 percent MAC) to 117.7 inches (27.1 percent MAC) from the reference datum. (See Part 2 paragraph 2 for landing gear up considerations). Datum point is 102 inches forward of the centre line of the main spar.

13 For complete details of Weight and Balance for all four configurations of Expeditor aircraft, refer to EO 05-45B-8, Weight and Balance Data.

SAMPLE FLIGHT PLANNING PROBLEM

USE OF THE CHARTS

14 The following sample problem is given to show the method used to calculate the amount of fuel necessary for each phase of the proposed flight. An additional hour of low consumption cruise is included in the problem to simulate situations requiring holding or any other need for reserve fuel. Actual chart values are employed to demonstrate how the charts should be used.

CONDITIONS AND DETAILS OF THE PROPOSED FLIGHT

15 Two passengers and some cargo are to be flown to an airfield 640 nautical air miles from base. The first 400 nautical miles may be flown above 3000 ft. and the remainder above 8000 ft.

STATEMENT OF EXISTING CONDITIONS

16 Outline the condition of the problem and the question to be answered - Refer to EO 05-45B-8 Weight and Balance Data:

Required Range.....640 nautical miles

Winds.....5 knots effective tailwind at 5,000 ft. 15 knots effective headwind at 10,000 feet.

Basic Weight (From RCAF Form F)	6,360 lb.
Crew Weight (2 men at 180 lb./man)	360 lb.
Passenger Weight (2 men at 180 lb/man)	360 lb.
Cargo Weight	500 lb.
Fuel Weight (210 gallons at 7.2 lb./gallon)	1,512 lb.
Oil Weight (13.2 gallons at 9 lb./gallon)	119 lb.
Parachutes (4 at 20 lb. each)	80 lb.
TOTAL WEIGHT (gross weight)	9,291 lb.
MAXIMUM ALLOWABLE GROSS WEIGHT	9,300 lb.

NOTE

Ensure that the weight of safety equipment, when carried, has been included.

FUEL/CARGO RELATIONSHIP

17 The above data shows that the starting gross weight is within 9 lbs. of the maximum gross weight for the aircraft. Should it be desired to take on more cargo, proper use of the charts will show the amount of fuel that may be removed to allow for an equal weight in cargo to be taken abroad. Similarly, increases in fuel at the expense of cargo to obtain increased range may be calculated. Also, when operating above 9,000 lb., which is maximum landing weight, be certain the mission will be of such duration that sufficient fuel will be consumed to lower the gross weight to the maximum allowed for landing.

DETERMINATION OF THE ACTUAL FLIGHT PLAN

18 The first 400 nautical miles will be flown at 5,000 ft. altitude to take advantage of the tailwind. The remainder of the flight will be at 10,000 ft. due to terrain conditions. This 240 nautical miles will be flown against a 15 knot headwind.

FUEL ALLOWANCES

19 Allowance of fuel can be determined using the following system:

(a) Plot the fuel to be deducted for run up, taxiing, take off and climb, headwinds, and reserve, and hence determine the fuel available for cruise.

(b) On the Flight Operating Instruction Chart which corresponds to the gross weight of the aircraft determine in which column (i.e. at what power) it is possible to make the flight with the fuel available for cruise.

FUEL COMPUTATIONS

20 Determine the necessary fuel deduction as follows:

(a) Allowance for run-up (not included in any of the charts) 5 Imp. gal.

(b) Referring to the Climb Chart - Weight 9300 lbs. Fuel required for taxiing, take-off and climb to a pressure altitude of 10,000 ft. (Highest altitude to be attained during flight) 18.4 Imp. gal.

(c) To allow for headwind condition, 15 knot headwind will be encountered at 10,000 ft for 240 nautical miles, refer to Flight Operation Instruction Chart - Weight 8,500 to 9,300 lbs. (Do not consider the 5 knot tailwind. Let it be a safety factor).

(1) Variations in T.A.S. for Column 1 to Column V, at 10,000 ft. press. alt. 135 to 179 knots

(2) Average T.A.S. (approx.). 150 knots

(3) Time to travel 240 nautical miles at 150 knots 1 hr. 36 min.

(4) 150 knot T.A.S., with 15 knot headwind gives 135 knot G/S. Time to travel 240 nautical miles at 135 knots G/S 1 hr. 47 min.

(5) Loss of time due to headwind 11 min.

Refer to column on the same chart that indicates speed closest to 150 knots at 10,000 ft. i.e. Column IV

At 154 knots, fuel consumption 33 Imp. gph

(6) Therefore, fuel consumption during 11 min. 6 Imp. gal

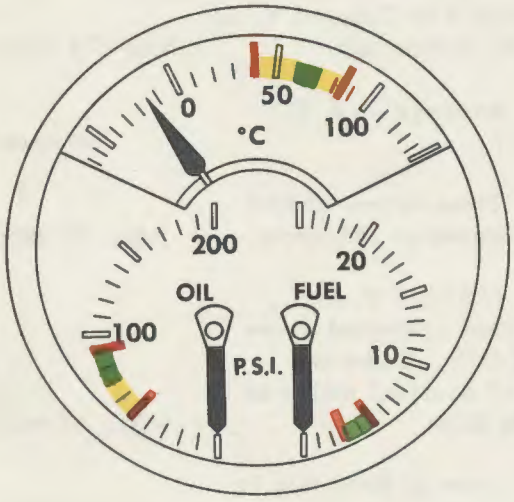
(d) The least allowance needs for the low consumption cruise for one hour at 10,000 feet (See Column V) 25 Imp. gal

(e) Summation of (a), (b)(6) and (d). Total allowance to be deducted 54.4 Imp. gal

Fuel available for cruise. Total fuel (210 gal) minus fuel allowance (54.4 Imp gal) 155 Imp. gal

AIRSPEED

	220 Knots	Maximum Allowable (Smooth Air)



OIL TEMPERATURE

	40°C	Minimum
	40 - 60°C	Minimum In Flight
	60 - 70°C	Normal
	70 - 85°C	Cautionary Range
	85°C	Maximum

OIL PRESSURE

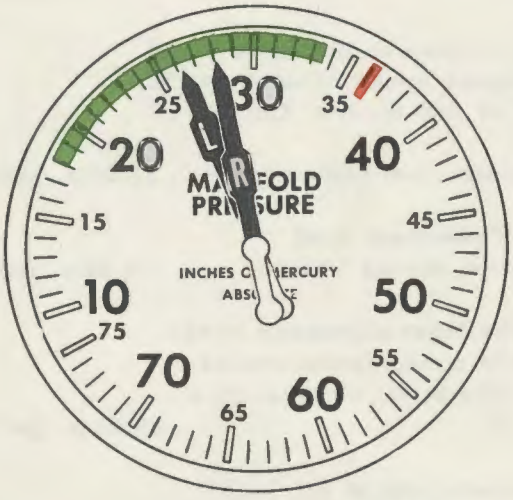
	50 psi	Minimum
	50 - 70 psi	Cautionary Range
	70 - 90 psi	Normal
	90 psi	Maximum

FUEL PRESSURE

	3 psi	Minimum
	3 - 5 psi	Normal
	5 psi	Maximum

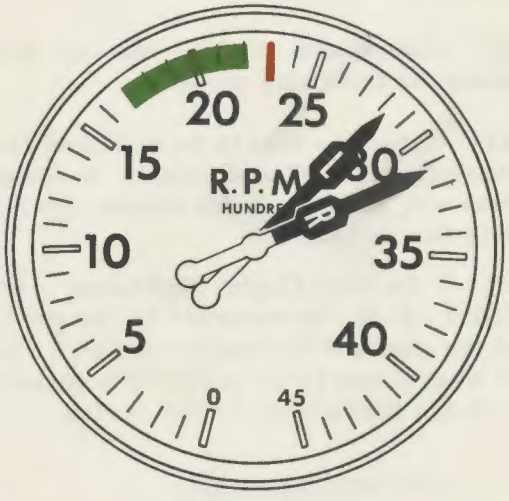
NOTE

Markings based upon 80/87 grade fuel.



MANIFOLD PRESSURE

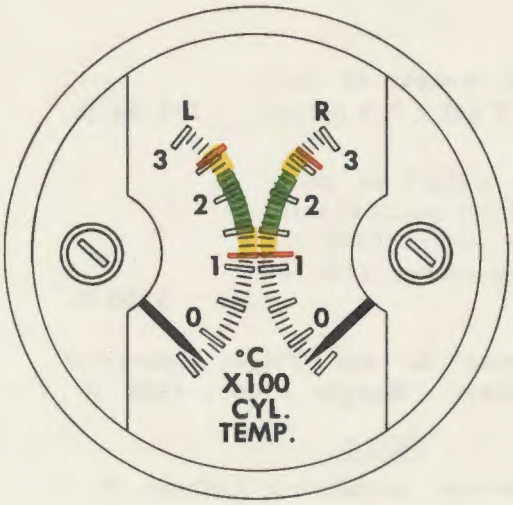
	18 - 33.5 in. Hg	Cruising
	36 in. Hg	Maximum



TACHOMETER

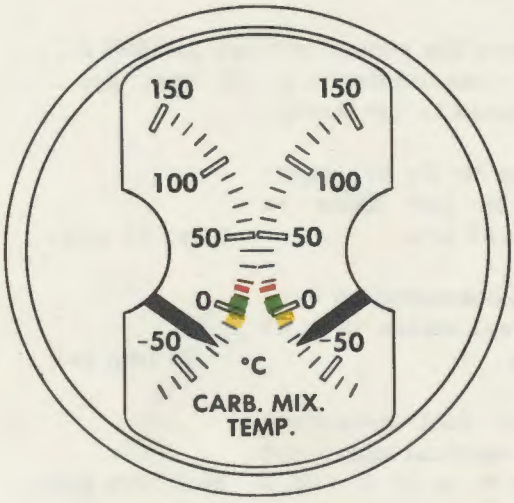
	1700 - 2200 rpm	Cruising
	2300 rpm	Maximum Allowable

Figure 4-1 Instrument Markings (Sheet 1 of 2)



CYLINDER HEAD TEMPERATURE

120°C	Minimum
120 - 150°C	Cautionary Range
150 - 232°C	Normal
232 - 260°C	Cautionary Range
260°C	Maximum

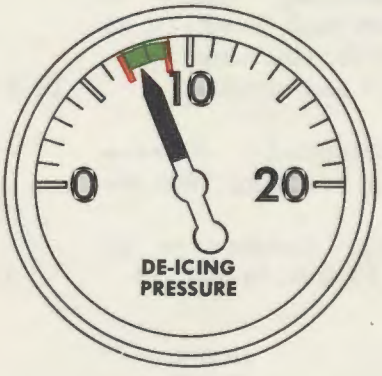


CARBURETTOR MIXTURE TEMPERATURE

15°C	Maximum
4° to 8°C	Normal
-3 to -10°C	Cautionary Range

SUCTION

3.75 in. Hg	Minimum
3.75 - 4.6 in. Hg	Normal
4.6 in. Hg	Maximum



DE-ICING PRESSURE

7 psi	Minimum
7 - 9 psi	Normal
9 psi	Maximum

Figure 4-1 Instrument Markings (Sheet 2 of 2)

(1) Total weight of fuel consumed
106.2 gal x 7.2 lb/gal = 764.64 lb.

(2) Total distance travelled
400 + 9.2 = 409.2 nautical miles

(3) Remaining distance to be flown
640 - 409 nautical miles = 231 nautical miles

(4) Conditions for final distance 231 nautical miles at 10,000 ft. with a 15 knot headwind. wt of aircraft 8528 lb.

NOTE

Although the weight of the aircraft is now 8528 lb. for the majority of the trip it will fall between 7500 and 8500 lb.

(k) Refer therefore to the Flight Operation Instruction Chart. Weight 7500 to 8500 lb. Column (IV)

(1) At 10,000 ft level record the power settings and the fuel consumption i.e.
31 Imp gph

The T.A.S. no headwind is 155 knots.
The G/S (with 15 knot headwind) is 140 knots

(2) Time to fly 231 nautical miles at 140 knots
231/140 - equals 1.65 hrs. = 1 hr. 39 min

(3) Fuel consumed during 231 mile flight
31 gph x 1.65 hrs = 51 Imp gal

(4) Total fuel consumed during total flight
106.2 + 51 = 157.2 Imp gal

(m) As a reserve determine the fuel required for a minimum consumption cruise at 10,000 ft. for one hour duration. The gross weight for the minimum consumption cruise will be Initial Weight minus the weight of the total fuel consumed during the whole flight. (i.e. 8292 lb - (157.2 gal x 7.2 lb/gal).
9292 - 1131.84 lb. = 8160 lb.

(1) Referring to the Flight Operating Instruction Chart Weight 7500 to 8500 lb, column V, altitude 10,000 ft. Record the power settings and the fuel consumption rate i.e. 24 gph

Reserve fuel for one hour = 24 Imp gal

(2) Total fuel required for the flight:

	Imp Gal
Run up	5
Taxiing, Take-Off and Climb to 5,000 ft.	10.2
Cruise at 5,000 ft.	84
Climb from 5,000 to 10,000 ft	7
Cruise at 10,000 ft	51
One hour fuel reserve	24
Total Fuel	181.2

TAKE-OFF DISTANCES
(FEET)

MODEL: All Expeditor 3 models
ENGINES: Two R-985-AN-14B

Hard Dry Runway
No Flaps

CONFIGURATION AND GROSS WEIGHT (LBS)	PRESSURE ALTITUDE	-5 DEGREES CENTIGRADE				15 DEGREES CENTIGRADE				35 DEGREES CENTIGRADE				55 DEGREES CENTIGRADE			
		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND	
		Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft
7500	SL	1166	1527	476	699	1226	1600	515	751	1359	1765	591	851	1659	2140	758	1073
	2000	1214	1587	515	749	1401	1816	620	888	1680	2160	771	1085	2050	2630	963	1349
	4000	1388	1800	614	879	1722	2220	790	1117	2135	2735	1007	1407	2550	3240	1244	1711
	6000	1743	2250	803	1136	2200	2815	1038	1448	2630	3340	1283	1765	3345	4240	1682	2299
	8000	2200	2810	1042	1450	2650	3360	1305	1738	3530	4460	1765	2408	4550	5730	2360	3188
8500	SL	1638	2013	718	958	1722	2106	783	1034	1910	2323	898	1173	2330	2817	1126	1455
	2000	1705	2087	764	1013	1967	2389	923	1204	2360	2850	1118	1449	2880	3462	1433	1832
	4000	1950	2370	915	1199	2420	2922	1175	1515	3000	3602	1500	1914	3580	4275	1840	2325
	6000	2450	2956	1200	1543	3090	3708	1552	1978	3690	4402	1905	2403	4700	5579	2480	3103
	8000	3090	3708	1554	1980	3720	4435	1925	2426	4960	5882	2650	3306	6400	7552	3490	4319
9300	SL	2090	2460	970	1200	2200	2570	1030	1300	2440	2840	1210	1460	2980	3440	1500	1810
	2000	2180	2550	1040	1300	2510	2910	1240	1500	3010	3480	1520	1800	3680	4230	1910	2270
	4000	2490	2890	1120	1500	3090	3560	1560	1900	3820	4390	1970	2350	4570	5210	2440	2900
	6000	3125	3580	1610	1900	3940	4490	2070	2450	4720	5360	2500	3000	6000	6830	3300	3880
	8000	3940	4530	2050	2450	4750	5420	2550	3000	6340	7180	3500	4100	8170	9200	4550	5400

DATA AS OF: 10-15-52
DATA BASIS: Flight Tests

FUEL GRADE: 80/87
FUEL DENSITY: 7.2 lb/Imp. gal

Figure 4-2 Take-off Distances

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

MODEL(S): All Expeditor 3 Models ENGINE(S): R-985-AN-14B

CONFIGURATION: Clean
WEIGHT: 7500 Pounds

APPROXIMATE FROM SEA LEVEL RATE OF CLIMB	DIST.	TIME	FUEL	M.P. IN. Hg	CAS	PRESSURE ALTITUDE FEET	CAS	M.P. IN. Hg	APPROXIMATE FROM SEA LEVEL FUEL	TIME	DIST.	RATE OF CLIMB
1720	0	0	4 (1)	37.0	123	S.L.	123	37.0	4 (1)	0	0	1415
1460	6.1	3	8.5	33.0	122	5,000	122	33.0	9	3.6	7.3	1175
1105	13.5	6.8	14	28.0	117	10,000	117	28.0	16	8.5	16.5	850
730	23.4	12.3	19	23.0	113	15,000	113	23.0	22.5	15.9	30.4	500
350	39.1	21.5	26	19.0	110	20,000	110	19.0	34	31.5	57.5	150

CONFIGURATION: Clean
WEIGHT: 8500 Pounds

CONFIGURATION: Clean
WEIGHT: 9300 Pounds

APPROXIMATE FROM SEA LEVEL RATE OF CLIMB	DIST.	TIME	FUEL	M.P. IN. Hg	CAS	PRESSURE ALTITUDE FEET	CAS	M.P. IN. Hg	APPROXIMATE FROM SEA LEVEL FUEL	TIME	DIST.	RATE OF CLIMB
1250	0	0	4 (1)	37.0	123	S.L.						
1010	9	4.4	10.2	33.0	122	5,000						
649	21.2	10.5	18.4	28.0	117	10,000						
306	41.3	20.9	29.5	23.0	113	15,000						

CONFIGURATION:
WEIGHT:

REMARKS:

1. Fuel allowance for taxi and take-off

RATE OF CLIMB: FEET PER MINUTE
DISTANCE: Stat MILES
TIME: MINUTES
FUEL: Imperial Gallons
CAS: CALIBRATED AIRSPEED
M.P.: MANIFOLD PRESSURE

DATA AS OF: September 18, 1952
DATA BASIS: Flight Test

FUEL GRADE: 91/96
FUEL DENSITY: 7.2 lb/Imp Gal

Figure 4-3 Climb Chart for Normal Power

LANDING DISTANCE - FEET

STANDARD DAY

MODEL (S): All Expeditor 3 Models

ENGINE (S)(2) R-985-AN-14B

GROSS WEIGHT LB	BEST IAS FOR APPROACH		45 DEGREE FLAPS - HARD SURFACE - NO WIND							
	POWER OFF	POWER ON	AT SEA LEVEL		AT 2000 FT		AT 4000 FT		AT 6000 FT	
	MPH	MPH	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'
7500	88	68	630	1350	650	1405	685	1465	740	1560
8500	94	72	830	1550	860	1615	910	1700	970	1805
9300	97	76	990	1720	1020	1780	1090	1880	1160	2000

REMARKS:
1. Landing distance is based on the power off approach speed.
2. Approach power (at sea level): 2000 rpm, 20 in. Hg. manifold pressure.

DATA AS OF: 10-31-52
DATA BASIS: Flight Test

Figure 4-4 Landing Distances

LANDING DISTANCE - FEET

STANDARD DAY

MODEL (S): All Expeditor 3 Models

ENGINE (S)(2) R-985-AN-14B

GROSS WEIGHT LB	BEST IAS FOR APPROACH		45 DEGREE FLAPS - HARD SURFACE - NO WIND							
	POWER OFF	POWER ON	AT SEA LEVEL		AT 2000 FT		AT 4000 FT		AT 6000 FT	
	MPH	MPH	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'	GROUND ROLL	CLEAR 50'
7500	88	68	630	1350	650	1405	685	1465	740	1560
8500	94	72	830	1550	860	1615	910	1700	970	1805
9300	97	76	990	1720	1020	1780	1090	1880	1160	2000

REMARKS:
1. Landing distance is based on the power off approach speed.
2. Approach power (at sea level): 2000 rpm, 20 in. Hg. manifold pressure.

DATA AS OF: 10-31-52
DATA BASIS: Flight Test

Figure 4-4 Landing Distances

MAXIMUM ENDURANCE

STANDARD DAY

MODEL (S) All Expeditor 3 Models ENGINE(S): (2)R985-AN-14B

CONFIGURATION: Clean
WEIGHT: 9500

APPROXIMATE				CAS Miles/ Hr	PRESSURE ALTITUDE FEET
Gal/HR	MIX.	RPM	M.P. IN. Hg		
19	ML	1600	24.0	113	S.L.
20	ML	1600	23.5	107	5,000
22	ML	1600	22.0	103	10,000
25	ML	1800	19.5	108	15,000
					20,000
					25,000
					30,000

CONFIGURATION Clean
WEIGHT: 8500

CAS Miles/ Hr	APPROXIMATE			
	M.P. IN. Hg	RPM	MIX.	Gal/HR
106	22.5	1600	ML	18.5
100	21.5	1600	ML	17.5
99	19.5	1600	ML	19
104	19.0	1600	ML	23

CONFIGURATION: Clean
WEIGHT: 7500

APPROXIMATE				CAS Miles/ Hr	PRESSURE ALTITUDE FEET
Gal./HR	MIX.	RPM	M.P. IN. Hg		
18.5	ML	1600	21.0	99	S.L.
16.5	ML	1600	19.5	96	5,000
19	ML	1600	17.5	93	10,000
22	ML	1600	17.0	96	15,000
					20,000
					25,000
					30,000

CONFIGURATION
WEIGHT:

CAS	APPROXIMATE			
	M.P. IN. Hg	RPM	MIX.	/HR

REMARKS:

Imp Gal./HR: FUEL FLOW
CAS: CALIBRATED AIRSPEED
M.P. MANIFOLD PRESSURE
MIX: MIXTURE

DATA AS OF: Jan. 1952
DATA BASIS: Flight Tests

FUEL GRADE: 91/96
FUEL DENSITY: 7.2 lb/Imp Gal

Figure 4-5 Maximum Endurance

AIRCRAFT MODEL (S): All Expeditor 3 Models

ENGINE (S): R-985-AN-14B

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WEIGHT LIMITS: Below 7500 TO 7500 POUNDS

EXTERNAL LOAD ITEMS: NONE

NUMBER OF ENGINES OPERATING: TWO

INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising move horizontally to right or left and select RANGE value equal to or greater than the statute or nautical air miles to be flown. Vertically below and opposite values nearest desired cruising altitude (ALT.) read R.P.M. manifold pressure (M.P.) and MIXTURE setting required. Refer to corresponding column and altitude for new power settings when gross weight falls below limits of this chart.

NOTES: Column I is for emergency high speed cruising only, Columns II, III, IV and V give progressive increase in range at a sacrifice in speed. Air miles per gal (MI/gal) (no wind), gal per hr. (GPH) and true airspeed (T.A.S.) are approximate values for reference. Range values are for an average airplane flying alone (no wind)

COLUMN I		FUEL (1)	COLUMN II		COLUMN III		COLUMN IV		FUEL (1)	COLUMN V	
RANGE IN AIRMILES		IMP	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		IMP	RANGE IN AIRMILES	
STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
295	255	115	580	505	640	555	700	610	115	755	655
255	220	100	505	440	555	480	605	525	100	655	570
205	180	80	405	350	445	390	485	420	80	525	455
155	135	60	300	260	335	290	365	320	60	395	340
100	85	40	200	175	220	190	240	210	40	260	225
50	45	20	100	85	110	95	120	105	20	130	115

MAXIMUM CONTINUOUS						PRESS	5.05 STAT. (4.4 NAUT.) MI./gal						5.55 STAT (4.83 NAUT.) MI./gal						6.06 STAT (5.25 NAUT.) MI./gal						PRESS	6.55 STAT. (5.7 NAUT.) MI./gal					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000																			25000						
						20000																			20000						
2300	FT	BP	65	214	186	15000							2050	23.0	ML	35	196	170	1850	22.0	ML	30	181	157	15000	1600	20.5	ML	25	165	143
2300	FT	FR	82	210	182	10000	2000	27.0	ML	38	192	167	1850	26.0	ML	33	185	161	1700	25.5	ML	29	177	154	10000	1600	24.5	ML	26	168	146
2300	FT	FR	84	216	188	5000	1800	30.0	ML	37	186	162	1700	30.0	ML	32	181	157	1600	29.0	ML	28	175	152	5000	1600	27.5	ML	25	166	144
2300	37.5	FR	83	215	187	S.L.	2150	30.0	ML	36	182	158	2000	29.5	ML	32	176	153	1900	29.0	ML	27	168	146	S.L.	1600	29.0	ML	24	157	136

REMARKS:

1 Make allowance for warm-up, take-off and climb (see fig.4-5) plus allowances for wind, reserve and combat as required.

All fuel quantities in Imperial gallons.

DATA AS OF: 9-18-52 BASED ON. Flight Test

EXAMPLE

At 7400 lb. gross weight with 60 gal. of fuel (after deducting total allowances of 30 gal.) to fly 375 statute airmiles at 10,000 ft. altitude maintain 1700 rpm and 25.5 in. manifold pressure with mixture set: Manual Lean .

LEGEND

ALT.: Pressure Altitude
M.P.: Manifold Pressure
GPH: Fuel flow per hour
TAS: True Airspeed
KN. : Knots
S.L.: Sea Level
F.R.: Full Rich
A.R.: Auto Rich
A.L.: Auto Lean
C.L.: Cruising Lean
M.L: Manual Lean
F.T.: Full Throttle
B.P.: Best Power

FUEL GRADE: 91/96
FUEL DENSITY: 7.2 lb/Imp Gal

Figure 4-6 Flight Operation Instruction Chart, Two Engines (Sheet 1 of 3 sheets)

AIRCRAFT MODEL (S):	FLIGHT OPERATION INSTRUCTION CHART	EXTERNAL LOAD ITEMS:
All Expeditor 3 Models	**STANDARD DAY**	NONE
ENGINE (S): R-985-AN-14B	CHART WEIGHT LIMITS: 7500 TO 8500 POUNDS	NUMBER OF ENGINES OPERATING: TWO

INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising move horizontally to right or left and select RANGE value equal to or greater than the statute or nautical air miles to be flown. Vertically below and opposite values nearest desired cruising altitude (ALT.) read R.P.M. manifold pressure (M.P.) and MIXTURE setting required. Refer to corresponding column and altitude for new power settings when gross weight falls below limits of this chart.

NOTES: Column I is for emergency high speed cruising only, Columns II, III, IV and V give progressive increase in range at a sacrifice in speed. Air miles per gal (MI./gal) (no wind), gal per hr. (GPH) and true airspeed (T.A.S.) are approximate values for reference. Range values are for an average airplane flying alone (no wind)

COLUMN I			FUEL[1]	COLUMN II						COLUMN III						COLUMN IV						FUEL[1]	COLUMN V					
RANGE IN AIRMILES			IMP	RANGE IN AIRMILES						RANGE IN AIRMILES						RANGE IN AIRMILES						IMP	RANGE IN AIRMILES					
STATUTE		NAUTICAL	GAL.	STATUTE		NAUTICAL				STATUTE		NAUTICAL				STATUTE		NAUTICAL				GAL.	STATUTE		NAUTICAL			
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]																												
530		460	210	955		830				1050		910				1220		1060				210	1390		1210			
505		440	200	910		790				1000		870				1160		1010				200	1325		1150			
455		395	180	820		710				895		780				1045		908				180	1195		1040			
405		350	160	730		635				795		690				930		810				160	1060		920			
350		305	140	635		550				700		610				810		705				140	930		810			
300		260	120	545		475				600		520				695		605				120	795		690			
250		220	100	455		395				500		435				580		505				100	660		575			
200		175	80	365		315				400		350				465		405				80	530		460			
150		130	60	270		235				300		260				350		305				60	400		350			
100		85	40	180		155				200		175				230		200				40	265		230			
50		45	20	90		80				100		85				115		100				20	130		115			
MAXIMUM CONTINUOUS			PRESS	4.55 STAT (3.96 NAUT.) MI./gal						4.98 STAT (4.31 NAUT.) MI./gal						5.8 STAT (5.04 NAUT.) MI./gal						PRESS	6.63 STAT. (5.75 NAUT.) MI./gal					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN
							40000																		40000						
							35000																		35000						
							30000																		30000						
							25000																		25000						
							20000																		20000						
2300	FT	BP	52	205	178	15000													2000	22.0	ML	31	179	159	15000	1800	20.0	ML	26	159	138
2300	FT	FR	81	208	181	10000	2100	27.0	ML	43	196	170	2000	27.0	ML	38	191	166	1800	25.0	ML	31	178	155	10000	1600	23.0	ML	24	159	138
2300	FT	FR	84	215	187	5000	1950	30.5	ML	42	191	166	1850	30.0	ML	37	185	161	1600	30.0	ML	30	174	151	5000	1600	25.5	ML	23	153	133
2300	37.5	FR	85	214	186	S.L.	2200	30.0	ML	40	184	160	2100	30.0	ML	36	179	156	2000	28.0	ML	29	168	146	S.L.	1600	26.5	ML	21	140	122

REMARKS:

1 Make allowance for warm-up, take-off and climb (see fig 4-5) plus allowances for wind, reserve and combat as required.

All fuel quantities in Imperial gallons.

DATA AS OF: 9-18-52 BASED ON. Flight Test

EXAMPLE

At 8100 lb. gross weight with 180 gal. of fuel (after deducting total allowances of 28 gal.) to fly 800 statute airmiles at 5000 ft. altitude maintain 1950 rpm and 30.5 in. manifold pressure with mixture set: Manual Lean when weight decreases below 7500 lb. refer to next weight chart, below to 7500 lb under col. II to 5000 ft.

LEGEND

ALT.: Pressure Altitude
M.P.: Manifold Pressure
GPH: Fuel flow per hour
TAS: True Airspeed
KN. : Knots
S.L.: Sea Level
F.R.: Full Rich
A.R.: Auto Rich
A.L.: Auto Lean
C.L.: Cruising Lean
M.L: Manual Lean
F.T.: Full Throttle
B.P.: Best Power

FUEL GRADE: 91/96
FUEL DENSITY: 7.2 lb/Imp Gal

Figure 4-6 Flight Operation Instruction Chart, Two Engines (Sheet 2 of 3 sheets)

AIRCRAFT MODEL (S): All Expeditor 3 Models

ENGINE (S): R-985-AN-14B

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WEIGHT LIMITS: 8500 TO 9500 POUNDS

EXTERNAL LOAD ITEMS: NONE

NUMBER OF ENGINES OPERATING: TWO

INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising move horizontally to right or left and select RANGE value equal to or greater than the statute or nautical air miles to be flown. Vertically below and opposite values nearest desired cruising altitude (ALT.) read R.P.M. manifold pressure (M.P.) and MIXTURE setting required. Refer to corresponding column and altitude for new power settings when gross weight falls below limits of this chart.

NOTES: Column I is for emergency high speed cruising only, Columns II, III, IV and V give progressive increase in range at a sacrifice in speed. Air miles per gal. (MI./gal) (no wind), gal per hr. (GPH) and true airspeed (T.A.S.) are approximate values for reference. Range values are for an average airplane flying alone (no wind)

COLUMN I		FUEL[1] IMP GAL.	COLUMN II		COLUMN III		COLUMN IV		FUEL[1] IMP GAL.	COLUMN V	
RANGE IN AIRMILES			RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES			RANGE IN AIRMILES	
STATUTE	NAUTICAL		STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL		STATUTE	NAUTICAL
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING [1]											
525	455	210	870	755	955	830	1135	990	210	1305	1135
500	435	200	830	720	910	790	1100	955	200	1245	1080
450	390	180	745	645	820	710	970	845	180	1120	975
400	350	160	665	580	730	635	865	750	160	995	865
350	305	140	580	505	640	555	755	655	140	870	755
300	260	120	495	430	545	475	650	565	120	745	650
250	220	100	415	360	455	395	540	470	100	620	540
200	175	80	330	285	365	315	430	375	80	500	430
150	130	60	250	220	270	235	325	280	60	375	325
100	85	40	165	145	180	155	215	185	40	250	215
50	45	20	85	75	90	80	110	95	20	125	110

MAXIMUM CONTINUOUS						PRESS ALT. FEET	4.14 STAT. (3.6 NAUT.) MI./gal						4.56 STAT. (3.96 NAUT.) MI./gal						5.4 STAT. (4.69 NAUT.) MI./gal						PRESS ALT. FEET	6.21 STAT (5.40 NAUT.) MI./ gal					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000																			25000						
						20000																			20000						
2300	FT	BP	49	197	171	15000																			15000	1850	21.0	ML	28	163	141
2300	FT	FR	82	206	179	10000	2200	27.5	ML	47	203	176	1900	27.0	ML	42	191	166	1850	26.0	ML	33	177	154	10000	1600	24.0	ML	25	155	135
2300	FT	FR	85	212	184	5000	2000	30.5	ML	46	194	169	1950	30.0	ML	41	185	161	1650	29.5	ML	32	171	149	5000	1600	26.0	ML	23	147	128
2300	37.5	FR	82	210	183	S.L.	2300	30.5	ML	44	186	162	2200	30.0	ML	39	180	156	2000	29.0	ML	31	168	146	S.L.	1600	29.0	ML	24	148	129

REMARKS:

1 Make allowance for warm-up, take-off and climb (see fig 4-5) plus allowances for wind, reserve and combat as required.

All fuel quantities in Imperial gallons.

DATA AS OF: 9-18-52 BASED ON. Flight Test

EXAMPLE

At 9300 lb. gross weight with 190 gal. of fuel (after deducting total allowances of 18 gal.) to fly 1000 statute airmiles at 10,000 ft. altitude maintain 1600 rpm and 24.0 in. manifold pressure with mixture set: Manual Lean when weight decreases below 8500 lb. refer to next weight chart, 7500 to 8500 lb under col. V to 10,000 ft.

LEGEND

ALT.: Pressure Altitude
M.P.: Manifold Pressure
GPH: Fuel flow per hour
TAS: True Airspeed
KN. : Knots
S.L.: Sea Level

F.R.: Full Rich
A.R.: Auto Rich
A.L.: Auto Lean
C.L.: Cruising Lean
M.L: Manual Lean
F.T.: Full Throttle
B.P.: Best Power

FUEL GRADE: 91/96
FUEL DENSITY: 7.2 lb/Imp Gal

Figure 4-6 Flight Operation Instruction Chart, Two Engines (Sheet 3 of 3 sheets)

AIRCRAFT MODEL (S): All Expeditor 3 Models ENGINE (S): R-985-AN-14B	**FLIGHT OPERATION INSTRUCTION CHART** **STANDARD DAY** CHART WEIGHT LIMITS: Below 7500 TO 7500 POUNDS	EXTERNAL LOAD ITEMS: NONE NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising move horizontally to right or left and select RANGE value equal to or greater than the statute or nautical air miles to be flown. Vertically below and opposite values nearest desired cruising altitude (ALT.) read R.P.M. manifold pressure (M.P.) and MIXTURE setting required. Refer to corresponding column and altitude for new power settings when gross weight falls below limits of this chart.

NOTES: Column I is for emergency high speed cruising only, Columns II, III, IV and V give progressive increase in range at a sacrifice in speed. Air miles per gal (MI./gal) (no wind), gal per hr. (GPH) and true airspeed (T.A.S.) are approximate values for reference. Range values are for an average airplane flying alone (no wind)

COLUMN I							FUEL (1) IMP GAL.	COLUMN II						COLUMN III						COLUMN IV						FUEL (1) IMP GAL.	COLUMN V					
RANGE IN AIRMILES								RANGE IN AIRMILES						RANGE IN AIRMILES						RANGE IN AIRMILES							RANGE IN AIRMILES						
STATUTE			NAUTICAL					STATUTE			NAUTICAL			STATUTE			NAUTICAL			STATUTE			NAUTICAL				STATUTE			NAUTICAL		
SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)																															
445			390				120	825			715															120	875			760		
370			320				100	690			600															100	730			635		
295			255				80	550			480															80	590			515		
220			190				60	415			360															60	445			385		
150			130				40	275			240															40	300			260		
75			65				20	140			120															20	150			130		
MAXIMUM CONTINUOUS							PRESS	6.89 STAT. (5.98 NAUT.) MI./gal						STAT. NAUT. MI./						STAT. NAUT. MI./						PRESS	7.3 STAT. (6.34 NAUT.) MI./gal					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN		ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN
							40000 35000 30000																			40000 35000 30000						
							25000 20000 15000																			25000 20000 15000						
2300	33.0	FR	43	160	139		10000 5000	1800	30.0	ML	18	128	111													10000 5000	1650	29.7	ML	17	120	104
2300	37.5	FR	42	161	140		S.L.	2100	30.0	ML	19	130	113													S.L.	2000	28.0	ML	15	116	101

REMARKS:

1 Make allowance for wind and reserve as required.

EXAMPLE

At 7400 lb. gross weight with 80 gal. of fuel (after deducting total allowances of 25 gal) to fly 500 statute airmiles at 5000 ft. altitude maintain 1650 rpm and 29.7 in. manifold pressure with mixture set: Manual Lean .

LEGEND

ALT.: Pressure Altitude
M.P.: Manifold Pressure
GPH: Fuel flow per hour
TAS: True Airspeed
KN. : Knots
S.L.: Sea Level

F.R.: Full Rich
A.R.: Auto Rich
A.L.: Auto Lean
C.L.: Cruising Lean
M.L: Manual Lean
F.T.: Full Throttle
B.P.: Best Power

All fuel quantities in Imperial gallons.

DATA AS OF: 9-18-52 BASED ON. Flight Test

FUEL GRADE: 91/96
FUEL DENSITY: 7.2 lb/Imp Gal

Figure 4-7 Flight Operation Instruction Chart, One Engine (Sheet 1 of 3 sheets)

AIRCRAFT MODEL (S): All Expeditor 3 Models

ENGINE (S): R-985-AN-14B

FLIGHT OPERATION INSTRUCTION CHART
STANDARD DAY

CHART WEIGHT LIMITS: 7500 TO 8500 POUNDS

EXTERNAL LOAD ITEMS: NONE

NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising move horizontally to right or left and select RANGE value equal to or greater than the statute or nautical air miles to be flown. Vertically below and opposite values nearest desired cruising altitude (ALT.) read R.P.M. manifold pressure (M.P.) and MIXTURE setting required. Refer to corresponding column and altitude for new power settings when gross weight falls below limits of this chart.

NOTES: Column I is for emergency high speed cruising only, Columns II, III, IV and V give progressive increase in range at a sacrifice in speed. Air miles per gal (Mi/gal) (no wind), gal per hr. (GPH) and true airspeed (T.A.S.) are approximate values for reference. Range values are for an average airplane flying alone (no wind)

COLUMN I		FUEL (1)	COLUMN II		COLUMN III		COLUMN IV		FUEL (1)	COLUMN V	
RANGE IN AIRMILES		IMP	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		IMP	RANGE IN AIRMILES	
STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
755	655	210							210	1270	1100
720	625	200							200	1210	1050
650	565	180							180	1100	955
575	500	160							160	970	845
505	440	140							140	845	735
430	375	120							120	725	630
360	310	100							100	605	525
290	250	80							80	485	420
215	185	60							60	360	310
145	125	40							40	240	210
70	60	20							20	120	105

MAXIMUM CONTINUOUS						PRESS	STAT. NAUT. MI./						STAT. NAUT. MI./						STAT. NAUT. MI./						PRESS	6.05 STAT. (5.26 NAUT.) MI./gal					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT /HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT /HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT /HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000																			25000						
						20000																			20000						
						15000																			15000						
2300	33.0	FR	43	155	135	10000																			10000						
2300	37.5	FR	42	158	137	5000																			5000	2000	30.0	ML	19	115	100
						S.L.																			S.L.	2200	30.0	ML	20	125	110

REMARKS:

1 Make allowance for wind and reserve as required.

All fuel quantities in Imperial gallons.

DATA AS OF: 9-18-52 BASED ON. Flight Test

EXAMPLE

At 8300 lb. gross weight with 170 gal. of fuel (after deducting total allowances of 30 gal.) to fly 960 statute airmiles at 5000 ft. altitude maintain 2000 rpm and 30.0 in. manifold pressure with mixture set: Manual Lean when weight decreases below 7500 lb. refer to next weight chart, below to 7500 lb under col. V to 5000 ft.

LEGEND

ALT.: Pressure Altitude
M.P.: Manifold Pressure
GPH: Fuel flow per hour
TAS: True Airspeed
KN. : Knots
S.L.: Sea Level

F.R.: Full Rich
A.R.: Auto Rich
A.L.: Auto Lean
C.L.: Cruising Lean
M.L: Manual Lean
F.T.: Full Throttle
B.P.: Best Power

FUEL GRADE: 91/96
FUEL DENSITY: 7.2 lb/Imp Gal

Figure 4-7 Flight Operation Instruction Chart, One Engine (Sheet 2 of 3 sheets)

AIRCRAFT MODEL (S): All Expeditor 3 Models	FLIGHT OPERATION INSTRUCTION CHART STANDARD DAY	EXTERNAL LOAD ITEMS: NONE
ENGINE (S): R-985-AN-14B	CHART WEIGHT LIMITS: 8500 TO 9500 POUNDS	NUMBER OF ENGINES OPERATING: ONE

INSTRUCTIONS FOR USING CHART: Select figure in FUEL column equal to or less than amount of fuel to be used for cruising move horizontally to right or left and select RANGE value equal to or greater than the statute or nautical air miles to be flown. Vertically below and opposite values nearest desired cruising altitude (ALT.) read R.P.M. manifold pressure (M.P.) and MIXTURE setting required. Refer to corresponding column and altitude for new power settings when gross weight falls below limits of this chart.

NOTES: Column I is for emergency high speed cruising only, Columns II, III, IV and V give progressive increase in range at a sacrifice in speed. Air miles per gal (MI./gal) (no wind), gal per hr. (GPH) and true airspeed (T.A.S.) are approximate values for reference. Range values are for an average airplane flying alone (no wind)

COLUMN I RANGE IN AIRMILES STATUTE	COLUMN I RANGE IN AIRMILES NAUTICAL	FUEL (1) IMP GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL (1) IMP GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
725	630	210							210	1160	1010
690	600	200							200	1105	960
620	540	180							180	995	865
550	480	160							160	885	770
480	420	140							140	775	675
410	360	120							120	665	580
345	300	100							100	550	470
275	240	80							80	440	380
205	235	60							60	330	290
140	160	40							40	220	190
70	60	20							20	110	95

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	PRESS ALT. FEET	STAT. NAUT. MI./ R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT /HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	STAT. NAUT. MI./ R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT /HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	STAT. NAUT. MI./ R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT /HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN	PRESS ALT. FEET	5.52 STAT. (4.8 NAUT.) MI./ gal R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT G/HR	APPROX. T.A.S. MPH	APPROX. T.A.S. KN
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000																			25000						
						20000																			20000						
						15000																			15000						
						10000																			10000						
2300	33.0	FR	43	148	129	5000																			5000						
2300	37.5	FR	42	154	134	S.L.																			S.L.	2300	30.0	ML	21	115	100

REMARKS:

1 Make allowance for wind and reserve as required.

All fuel quantities in Imperial gallons.

DATA AS OF: 9-18-52 BASED ON. Flight Test

EXAMPLE

At 9300 lb. gross weight with 120 gal. of fuel (after deducting total allowances of 22 gal) to fly 350 statute airmiles at 5000 ft. altitude maintain 2300 rpm and 33.0 in. manifold pressure with mixture set: Full Rich when weight decreases below 8500 lb. refer to next weight chart, 7500 to 8500 lb under col. V to 5000 ft.

LEGEND

ALT.:Pressure Altitude
M.P.:Manifold Pressure
GPH:Fuel flow per hour
TAS:True Airspeed
KN. :Knots
S.L.:Sea Level

F.R.:Full Rich
A.R.:Auto Rich
A.L.:Auto Lean
C.L.:Cruising Lean
M.L: Manual Lean
F.T.: Full Throttle
B.P.: Best Power

FUEL GRADE: 91/96
FUEL DENSITY: 7.2 lb/Imp Gal

Figure 4-7 Flight Operation Instruction Chart, One Engine (Sheet 3 of 3 sheets)

POSITION ERROR CORRECTION

19. The following charts give the position error correction for the airspeed indicator:

GEAR AND FLAPS UP ADD CORRECTION TO CORRECTED INSTRUMENT READING TO OBTAIN CAS		GEAR AND FLAPS DOWN ADD CORRECTION TO CORRECTED INSTRUMENT READING TO OBTAIN CAS	
IAS	CORRECTION	IAS	CORRECTION
70	+4	50	0
80	+4	60	+0.5
90	+4	70	+1
100	+4	80	+1
110	+4	90	+1
120	+4	100	+1
130	+4	110	+1
140	+4		
150	+4		
160	+4		
170	+4		
180	+4		
190	+4		
200	+4		
210	+4		

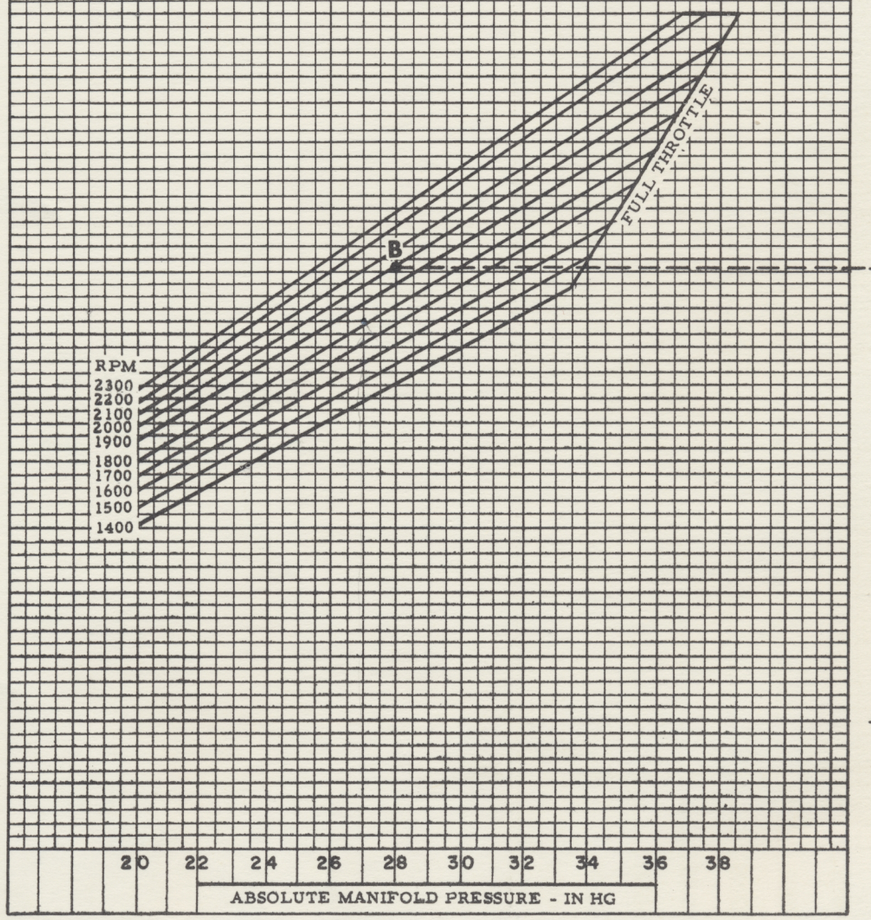
Figure 4-8 Position Error Correction Table

SEA LEVEL PERFORMANCE HORSEPOWER VS. MANIFOLD PRESSURE

To Find Actual H.P. When Given Press. Alt., Rpm, Manifold Pressure, And Outside Air Temp.

EXAMPLE

1. Locate position A on altitude curve for given RPM (2000) and MP (28").
2. Locate "B" on sea level chart for same RPM and MP. Transfer to C.
3. Connect A and C by straight line and read horsepower at given altitude D (282 H.P. at 5000 feet).
4. Correct horsepower at D for temperature.
   (a) Add 8°C to outside air temp. To find temp. of air entering carburettor.
   (b) Find difference between air entering carburettor and std. altitude temp.
   (c) H.P. at D should be corrected as follows:
   Add 1% for each 6°C decrease in Step (b).
   Subtract 1% for each 6°C increase in Step (b).



ALTITUDE PERFORMANCE HORSEPOWER VS. MANIFOLD PRESSURE

ENGINE CALIBRATION CURVE
EXPEDITOR 3 ALL MODELS

Engine - P & W Wasp Jr. R-985-AN14B
Prop. Gear Ratio - D.D.
Compression Ratio - 6:1
Impeller Gear Ratio - 10:1
Impeller Dia. In. - 6.875
Carburettor - NA-R9B

Fuel Grade 91/96 Octane

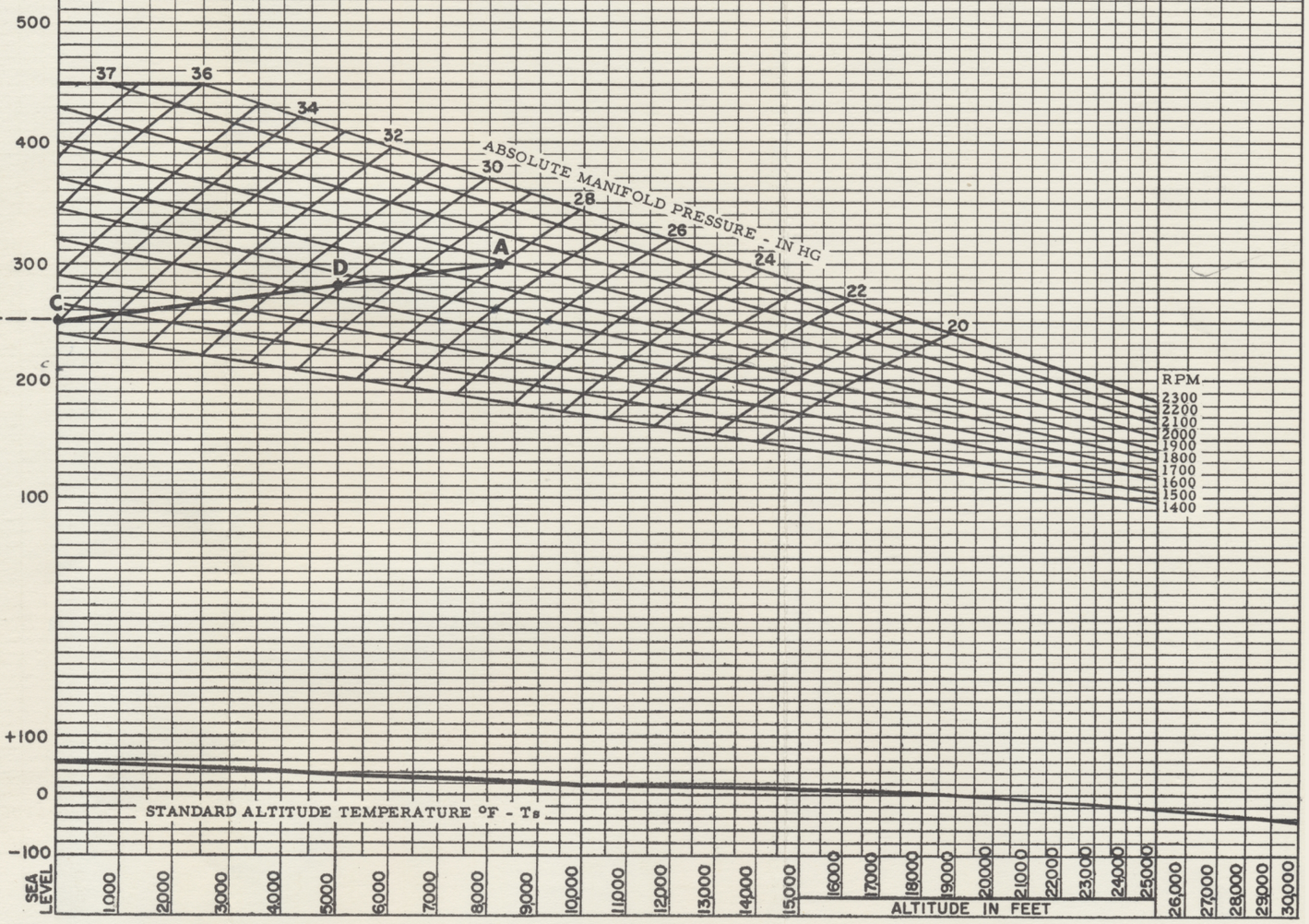


Figure 4-9 Engine Calibration Curve

ITEM	PAGE
Abandoning aircraft	71, 74
Aerobatics	57
After landing	60
After take-off (cold weather)	62
Aileron trim tabs	10
Air induction system	21
Air induction system schematic	20
Air speed limitations	77
Air temperature gauge	27
Alternative fuel grades	2, 77
Anti-icing systems	26
Artificial horizon	28
Ashtrays	39
Astro-compass mounting and stowage	33
Astrodome	33
Astrodome de-frosting	25, 27
Astrodome emergency release	31
Backfiring	47
Baggage compartments	38
Baggage compartment lighting	29
Bailing out	71, 74
Base leg check	59
Batteries, excessive drain on	62
Battery master switch	14
Before flight preliminaries	41, 61
Before leaving aircraft check	61, 63
Blind flying curtains	39, 40
Booster	21
Brake system	11, 24
Cabin door emergency release system	31
Cabin door, jettisoning of	68
Cabin heating	24, 57
Cabin lighting	28
Cabin ventilation	25, 57
Carburettor	20
Carburettor anti-icing	27
Circuit breakers	17
Circuit breaker diagrams	15, 16
Climb chart for normal power	85
Climbing	62
Cockpit check	45
Cockpit extension light	28
Cockpit floor diagram	26
Cockpit heating	24, 25
	57
Cockpit ventilation	57
Cold weather operation	61
Command radio installation	33
Communications equipment	33
Compass function switch	37
Compass loop control	37
Compass tuning meter	37
Control lock	10
Control lock, view of	11
Control pedestal, view of	10
Co-pilot's position, view of	18
Co-pilot's sub panel, view of	17
Covers	39
Cowl flaps (engine cooling)	21
Cowl flaps positions	22
Crash axe stowage	31
Crossfeed	20, 56
Crosswind component graph	53
Crosswind landing	59
Crosswind take-off	52
Cruising flight	52
Cylinder head temperatures	51
Data and map cases	39
De-icing system	18, 26
Description (general)	1
Difficulty in starting	47
Dimensions	1
Disc, fire extinguisher	30
Ditching	68, 73
Diving	57
Downwind check	58
Drift recorder	33, 34
Driftmeter	33
Electrical failure	75
Electrical fire	68
Electrical system, description of	13
Electrical system schematic	12
Elevator trim tabs	8
Emergency entrance	68, 71
Emergency equipment	69, 70
	76
Emergency exits	31, 71
Emergency exit jettison mechanism, view of	32
Emergency fuel control	20
Emergency fuel grades	2, 77
Emergency handling	65
Emergency landing	68, 72
Emergency maps	32

ITEM	PAGE
End of flight procedure	60, 63
Endurance, maximum (flying for)	55
Engine and accessory check	49, 62
Engine calibration curve	95
Engine cooling	21
Engine failure	65
Engine failure above safety speed	65
Engine failure below safety speed	65
Engine failure during flight	66
Engine fire extinguisher system	30
Engine fire in flight	67
Engine fire on ground	67
Engine gauge unit	20
Engine instruments	27
Engine limitations	77
Engine overspeeding	57, 77
Engine speed for landing	59
Exercising propeller	55, 62
External checks	41, 42
	43
External inspection Diagram	42
External power	13
External power receptacle	13
Failure to retract landing gear	23, 71
Failure to start procedure	48
Feathering	55
Feathering for test purposes	55
Feathering in emergency	66
Feathering, restrictions on	55
Feathering system	8
Final approach check	59
Fire detection lights	30
Fire, electrical	68
Fire, engine	67
Fire extinguisher discharge indicator	30
Fire extinguisher, engine	30, 68
Fire extinguishers, hand	29, 30
	68
Fire, fuselage	68
Firing tube, signal pistol	31
First aid kit	32
Flap system	10
Flaps, emergency operation of	75
Flap position indicator	11
Flare chute	31
Flight and engine restrictions	77
Flight characteristics	57
Flight characteristics, partial power	65
Flight control lock	10
Flight control lock, view of	11
Flight instruments	27
Flight operation instruction charts	88, 93
Flight planning	78
Flying controls system	8
Forced landing	68, 72
Forced landing instructions	32
Forward navigator's position, view of	33
Fuel capacities and specifications	2
Fuel contents gauge	6
Fuel controls	18
Fuel control in emergency	20
Fuel grades	2, 77
Fuel pressure warning lights	6, 20
Fuel system, description of	6
Fuel system, management of	56
Fuel system schematic	7
Fuel tank limitations	56
Fuel tank selection	18, 56
Fuel transfer	56
General arrangement diagrams	3, 4, 5
Generator failure warning lights	14, 19
Generators	13
Generator switches	14
Gyro horizon	28
Gyro instruments	17, 36
	49
Hand fire extinguishers	29, 30
Heating system, description of	24
Heating system, operation of	57
HF transmitters and receivers	34
Hot air controls	24
Hydraulic system, description of	11
Ignition booster	21
Ignition system	21
ILS receivers and indicators	37
Impeller	21
Inertia reel locks	29
"Initial", cockpit check on	58
Inlet louvres, maximum flow position, view of	58
Inside lighting	28
Instrument markings	80, 81
Instrument panel	19
Instrument panel lights	28
Instruments, flight and engine	27, 79
	80
Internal check	45
Interphone system	38
Inverters	13
Isolation amplifier	38

ITEM	PAGE
Jack box	38
Jump seat	39
Landing (cold weather)	63
Landing distances chart	86
Landing gear circuit breaker	75
Landing gear clutch, view of	76
Landing gear clutch pedal, view of	75
Landing gear emergency operation	71
Landing gear, failure to retract	23, 71
Landing gear, retraction of	23
Landing gear safety switch	23
Landing gear system	23
Landing gear warning system	23
Landing gear/wing flap hand crank, view of	75
Landing lights	29
Landing on one engine	67
Landing pattern diagram	59
Landing procedures	58, 63
Leading particulars	1
Leaning the mixture	54
Levelling out	52
Lighting equipment	28
Limited fuel grade	2, 77
Loop "L"-"R" control	37
Management of fuel system	56
Main door, emergency release system	31
Main instrument panel	19
Manifold heat in starting	47
Manifold heat, use of	62, 63, 66
Map lights	28
Maps, emergency	32
Marker beacon receiver	37
Master radio control panel	34
Master switch, batteries	14
Maximum endurance chart	87
Maximum endurance, flying for	54
Maximum engine speed	57
Maximum glide procedure	66
Maximum range, flying for	54
Maximum speed in diving	57
Maximum speed in rough air	57
MHF receiver (BC-455B)	34
Minimum run take-off	51
Minimum run landing	60
Mislanding	60
Mixture controls	18
Mixture, leaning	54
Navigation equipment	32
Navigation instructor's seat, view of	39
Navigation lights	29
Navigator's lighting	28
Navigators' positions, views of	33
Oil by-pass	6, 63
Oil capacities and specification	2
Oil cooling system	8
Oil, clogging in radiators	62, 63
Oil dilution in feathering	8, 23, 54
Oil dilution procedure	63
Oil dilution system	8
Oil pressure	8, 63
Oil shut-off valve	6
Oil system description of	6
Oil system schematic	9
Outside lighting	29
Over dilution, precautions against	63
Overpriming	46, 48
Overshoot	60
Overshoot on one engine	67
Parachute stowages	32
Parking brakes	24
Passenger carrying equipment	38
Passenger seating	38
Picketing the aircraft	40, 61, 63
Pilot's position, view of	10
Pilot's sub-panel, view of	14
Pitot heaters	27
Position error correction table	94
Post landing check	60
Post take-off check	52
Post take-off check (cold weather)	62
Power check	50
Power plant control system	18
Power settings, table of	55
Power supply, description of	13
Power supply controls	14
Power supply, schematic diagram	12
Precautionary landing	60
Precautionary take-off	51
Pre-flight preliminaries	41, 61
Pre-start checks	41
Pre-take-off check	50
Primer system	21
Priming the engines	46
Prohibited manoeuvres	78
Propeller	1, 23
Propeller anti-icer	66

ITEM	PAGE
Propeller anti-icing, description of	27
Propeller, exercising of	55, 62
Propeller failure	67
Propeller feathering for test purposes	55
Propeller feathering in emergency	66
Propeller feathering, restrictions on	56
Propeller feathering system	8
Propellers, flushing oil in flight	62
Propellers, pulling through	41, 61
Propeller, runaway	67
Pumping throttles during starting	46
Radio compass	34
Radio compass function switch	37
Radio compass loop control	37
Radio compass tuning meter	37
Radio control lights	28
Radio control panel	34
Radio equipment	33
Radio equipment location	35, 36
Radio equipment location, 3T only	36
Range, maximum (flying for)	54
Range receiver (BC 453B)	34
Rating of engines	1
Reading lamps	28
Rear navigator's position, view of	33
Relief equipment	39
Retraction of landing gear	23
Rudder trim tab	10
Runaway propeller	67
Safety harness, pilot and co-pilot	29
Seating, passenger	38
Seating, pilot and co-pilot	29
Selection of fuel tanks	18, 56
Sextant mounting and stowage	33
Short-field landing	60
Short-field take-off	51
Signal cartridges	31
Signal pistol	31
Signal pistol stowage, view of	31
Smoke, elimination of, after fire	68
Spare bulbs	17
Spare bulbs, location of	3, 4, 5
Speeds, limiting	72, 77
Speeds, recommended	77
Speeds, single-engine	77
Spinning	57
Stabilizer de-icing	26
Stalling	57
Starter	21
Starting difficulties	47
Starting procedure	46, 61
Stopping engines	60, 63
Tail cone drain	61
Take-off distances chart	84
Take-off procedure	50, 62
Tank capacities	2
Tarmac check	48
Taxiing procedure	49, 62
Throttle	20
Traffic pattern check list	58
Trim tabs, description of	8, 10
Turbulence, flying through	54
Undercarriage clutch pedal, view of	75
Undercarriage clutch, view of	76
Undercarriage emergency operation	71
Undercarriage, failure to retract	23, 71
Undercarriage/flap hand crank, view of	75
Undercarriage safety switch	23
Undercarriage system	23
Undercarriage warning system	23
Unfeathering after test feathering	55
Unfeathering system	8
Vacuum system	17
Ventilation system, description of	25
Ventilation system, operation of	57
VHF transceiver	37
Volt-ammeters	14
Voltage regulators	13
Warming-up procedure	48, 62
Warning lights (fuel)	6, 20
Warning lights (landing gear)	23
Warning horn (landing gear)	23
Warning horn, to disengage	23
Weight data	2, 78
Windows	29
Windshield de-frosting	27
Windshield wipers	39
Wing de-icing system	26
Wing flaps	10
Wing flaps, emergency operation of	75
Wobble pumps	18